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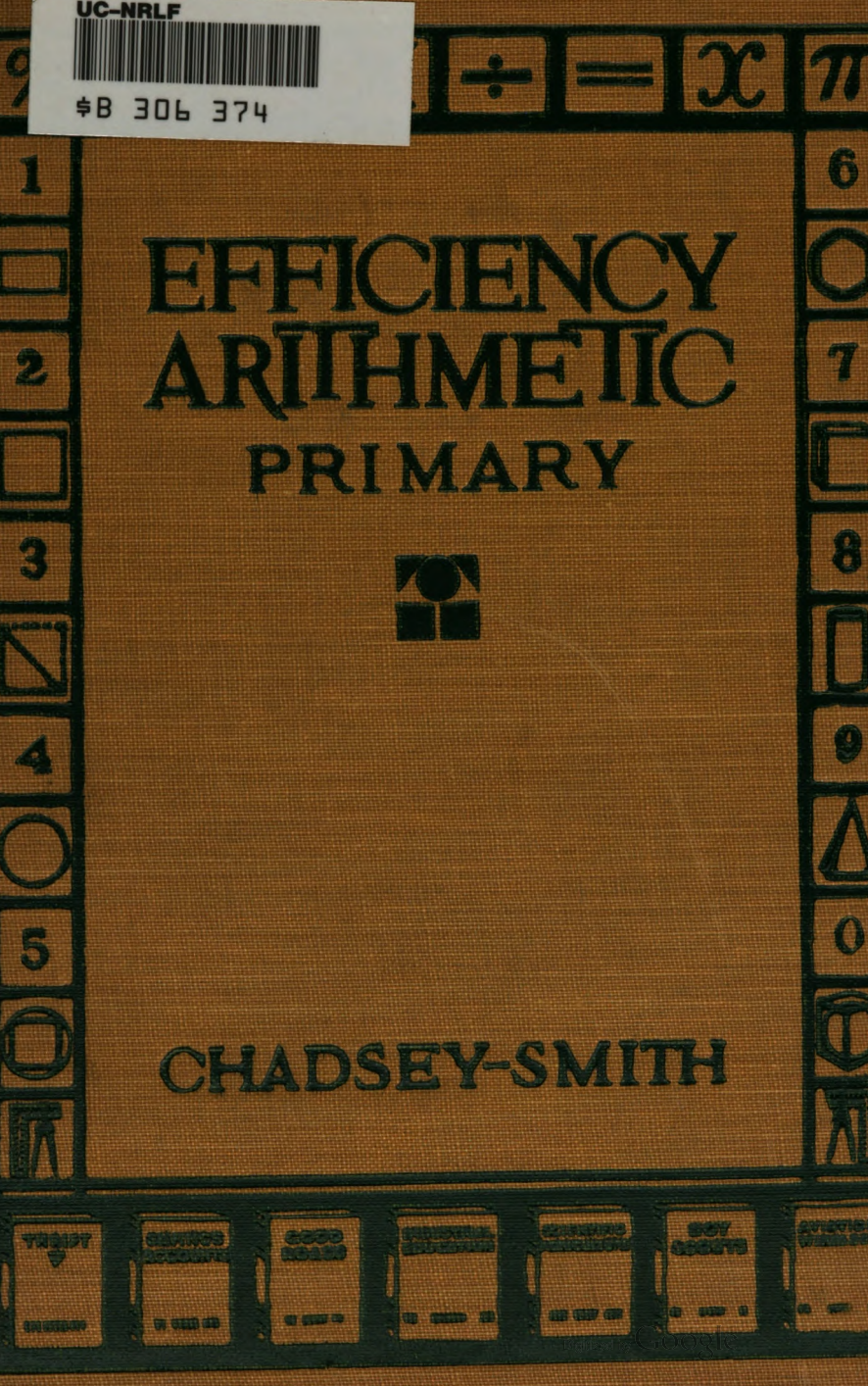


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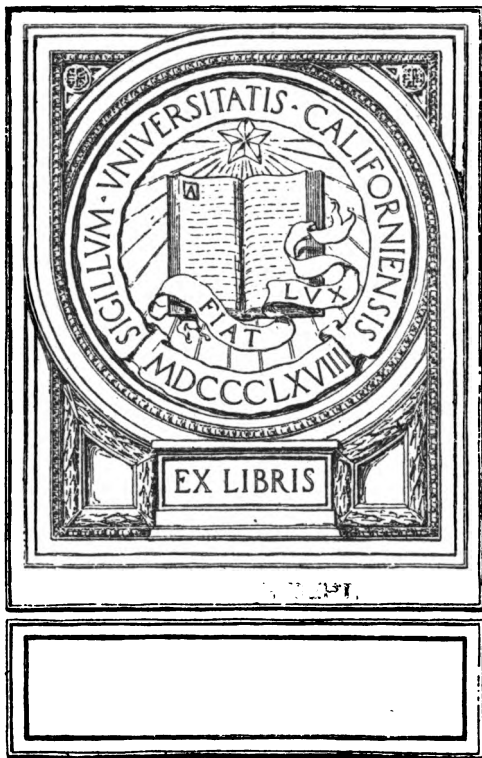
EFFICIENCY ARITHMETIC PRIMARY



CHADSEY-SMITH



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EFFICIENCY ARITHMETIC

PRIMARY

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PREFACE

The recent movement in testing results in education by means of standard scales and tests has revolutionized methods of instruction in many of the subjects. One of its results in the field of arithmetic has been to emphasize the necessity of well-planned drill work to secure speed and accuracy in the fundamental processes.

The authors, realizing that these drills should be based upon more accurate experimental data than those which had been previously obtained, formulated and carried out an experiment to determine the degrees of difficulty presented by the various facts in each of the processes of addition, subtraction, multiplication and division. The facts in each of these processes were then arranged into three groups: An easy group, a middle group and a difficult group.

When the Exercises for Speed and Accuracy were formulated, each fact was recorded as it was put into a problem, and the most difficult facts were made to occur most frequently. This plan was also followed in preparing the lists of abstract problems in addition, subtraction, multiplication and division. The emphasis is thus placed where it is needed.

The ability to select the proper process to solve a problem which is met in a social situation is just as important as the ability to compute correctly. This ability is developed by coming, in contact with a wide variety of concrete problems.

The first difficulty that confronts a pupil in the second grade, when he attempts to solve a concrete problem, is the language difficulty. Attention is called to the method used in this text to minimize this difficulty. The concrete problem is stated in

full for the teacher to read so that the pupil gets the concrete background. Each problem is followed by a condensed statement of the problem, which the pupil is to read and answer. After hearing a large number of concrete problems read and abbreviated in this way, the pupils learn how to select the process and condense the problem into the brief form.

The illustrations used in this book give the child a concrete background for the various activities and situations presented in many of the problems and take only a minimum amount of space. The authors believe they justify much more space than they actually take by helping the child over another difficulty—picturing the social situation involved in the problem.

Attention is also called to the care with which each of the fundamental processes is developed and to the explanations of the various steps from the easy to the difficult. This careful organization eliminates any necessity for a reorganization of the subject matter on the part of the teacher who uses this text.

The authors wish to express their indebtedness to Miss Katherine L. McLaughlin, Supervisor of City Grades, Department of Public Instruction, State of Wisconsin, and to Miss Myra Banks, Instructor in Arithmetic, Northrop Collegiate School, Minneapolis, Minnesota, for helpful material supplied.

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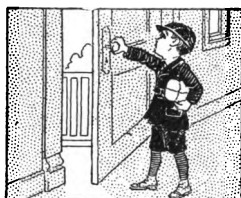
PRIMARY ARITHMETIC

PART I

COUNTING



ONE, TWO
BUCKLE MY SHOE



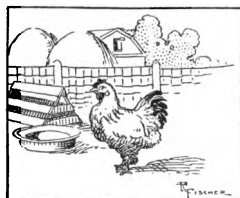
THREE, FOUR
SHUT THE DOOR



FIVE, SIX
PICK UP STICKS

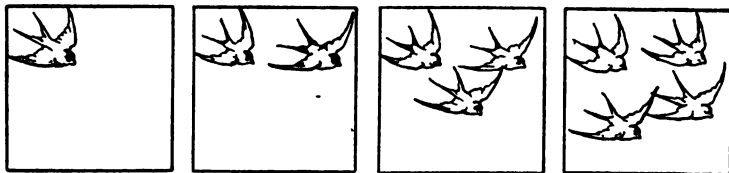


SEVEN, EIGHT
LAY THEM STRAIGHT



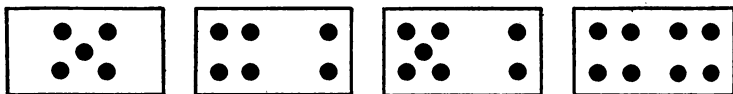
NINE, TEN
A BIG FAT HEN

1. Count to ten by using the number rhyme shown in the pictures.
2. Count to ten without using the rhyme.
3. How many doors are there in your schoolroom? Count them, pointing as you count.
4. Count the windows in your schoolroom.
5. Count the desks in one row. Count the rows of desks. What else is there in your schoolroom that you can count?
6. Count the number of buttons on one of your shoes.
7. Take ten steps, counting as you walk.



COUNTING BY GROUPS

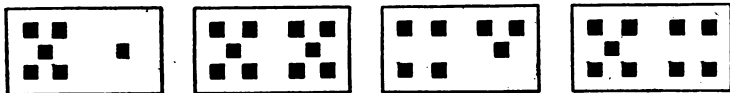
1. How many birds do you see in the first picture?
2. How many do you see in the second picture?
3. How many do you see in each group in each of the other pictures?



4. How many dots do you see in the group on the first card? Do you see this same group of dots on any of the other cards? Point to it.

5. How many dots are there on the second card? Notice that the six dots are arranged in two groups—a four group and a two group. Point to these groups on other cards.

6. How many dots are there on each of the other cards?



7. How many squares are there on each of these cards?

8. What different groups of squares do you see on these cards?

BORDER DESIGNS

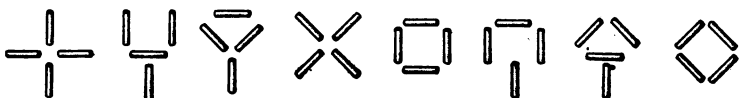
1. Make a border around your desk with two grains of corn in each group like this:



2. You can also make a pretty border by laying groups of three grains across your desk so:



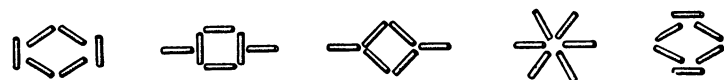
3. In how many ways can you arrange groups of four pegs to make a border? Here are a few ways:



4. Make a border design with five in each group. Use pegs, corn, melon seeds, or little strips of colored paper.



5. See how many different groups you can make with six in each group.

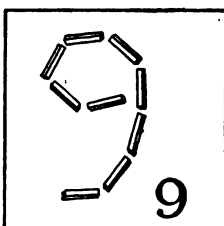
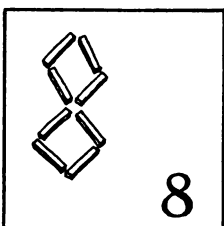
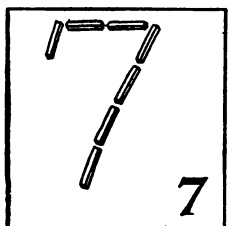
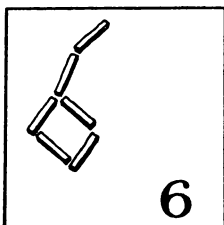
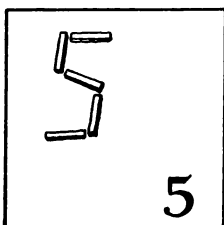
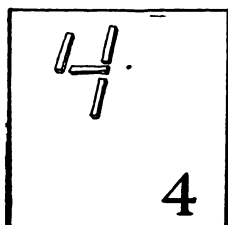
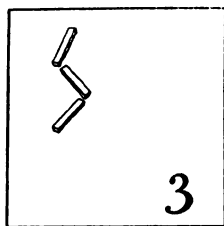
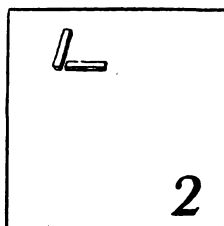
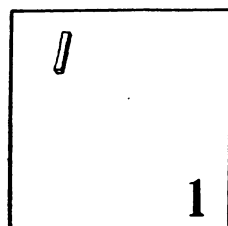


6. Try making a border, using first one group, then another.

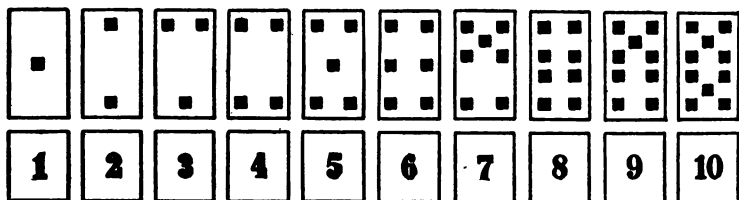
These little designs will be more interesting if used to decorate some piece of constructive work. This may be done by the use of colored crayons or by stick printing.

COUNTING AND WRITING IN FIGURES

These illustrations may easily be reproduced in a black-board drawing or worked out on a table with shoe pegs or other small sticks of uniform size; or with pieces of chalk rubbed flat on one side.



Lead the children to see that they can tell each printed figure by counting the number of pegs in each illustration, one peg for 1, two pegs for 2, etc. Have pupils arrange pegs to correspond to the shapes of the figures as a preliminary exercise to copying the figures. Show that 2 and 3 cannot be made as accurately as the other figures. This exercise connects the previous work in counting with the symbols of the numbers from 1 to 9.



MATCHING CARDS

Have envelopes containing group cards and a corresponding set of cards containing the numbers from 1 to 10. These cards should be mixed together and the pupils should arrange them in regular order as shown in the above illustration.

A FIGURE HUNT

The cards containing the numbers from 1 to 10 may be scattered about a table or set along the tray of the black-board in a miscellaneous arrangement. As many sets of cards should be used as there are pupils. The pupil who first secures a complete set of 10 cards and arranges them in order from 1 to 10 wins the game.

HOW TO WRITE FIGURES

Show how neatly and plainly you can copy this line of figures:

1 2 3 4 5 6 7 8 9 0

Many errors in calculation are directly traceable to carelessness in writing figures, hence it is quite important that pupils be taught at the very beginning how to make *neat* and *legible* figures. Their way of making 4's, 5's and 8's, especially, should be watched and corrected if need be.

One should not expect the figures made by first-grade pupils to be as small as these. Give many exercises in copying figures.

COUNTING WITH STICKS



Each child should be provided with a bundle of 10 sticks or toothpicks, and 9 loose ones.

1. How many sticks are there in the whole bundle? If you have the bundle of 10 sticks and 1 more of the loose ones, you have eleven sticks.

2. Take the bundle of 10 sticks and 2 of the loose sticks. The next number after eleven is twelve. Ten sticks and two sticks make how many sticks?

3. In the same way show that:

Ten sticks and three sticks make *thirteen* sticks.

Ten sticks and four sticks make *fourteen* sticks.

Ten sticks and five sticks make *fifteen* sticks.

Ten sticks and six sticks make *sixteen* sticks.

4. What part of the number sixteen stands for the ten? What part stands for the six?

5. What number stands for ten and seven?

6. What number stands for ten and eight?

7. What number stands for ten and nine?

8. Write the numbers from eleven to nineteen as follows: 11, 12, 13, 14, 15, 16, 17, 18, 19.

9. What is the next number after fourteen? After seventeen? After twelve? After eighteen? After thirteen? After eleven? After fifteen?

10. The next number after nineteen is *twenty*. Twenty is written 20. Count from 10 to 20.

To the Teacher: After a pupil has learned to count from 10 to 20, he is then ready to count from 20 to 100. Make this work concrete by having bundles of sticks in tens. Show that 21 is composed of 2 ten-bundles and 1 extra. Also show that the 2 in 21 stands for the number of tens and the 1 the number of units. Use other numbers in the same way.

Copy the following *number form* on a large sheet of bristol board or on the blackboard. Have the pupils follow the numbers on the number form as they count. This connects the symbols with the number names. Emphasize the repetition of the 1, 2, 3, 4, 5, 6, 7, 8, 9, with merely the change in the number of tens.

1	11	21	31	41	51	61	71	81	91
2	12	22	32	42	52	62	72	82	92
3	13	23	33	43	53	63	73	83	93
4	14	24	34	44	54	64	74	84	94
5	15	25	35	45	55	65	75	85	95
6	16	26	36	46	56	66	76	86	96
7	17	27	37	47	57	67	77	87	97
8	18	28	38	48	58	68	78	88	98
9	19	29	39	49	59	69	79	89	99
10	20	30	40	50	60	70	80	90	100

The numbers from 1 to 100 may be written on squares of cardboard about $1\frac{1}{4}$ inches square and placed in an envelope. For seat work, each pupil may be given a set of the numbers and asked to arrange them in rows in the same way as they are arranged on the number form. He may then be asked to count from 1 to 100 as he picks up the squares and puts them back in the envelope, one at a time.

Have the pupil turn the pages of this book one at a time and tell the number of each page until he reaches page 100. Do the same with his reader.

MAKING A CLOCK FACE



Take a round lid or piece of cardboard and place it on a piece either of heavy paper or of cardboard. Mark around the edge with your pencil. This makes a circle. Cut out this circle with your scissors.

Look at the clock face on this page. Name the numbers around the edge, beginning with 1.

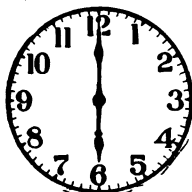
Make numbers on your clock face like those on the clock face on this page. Be careful to get them in the right places. Which number goes at the top? Which number is at the bottom? Which number is in the middle on the right side of the face? Which number is in the middle at the left side of the face?

Use toothpicks or other small sticks for hands, a long one pointing to 12 and a short one pointing to 7. Now you have a clock face so that you can tell time. When the short hand is at 7 and the long hand is at 12, we say it is 7 o'clock.

Leave the long hand pointing to 12 and place the short hand at the 3. It is now 3 o'clock by your clock face. Keep your clock face for later work in telling time.

The teacher should have a clock face with two movable hands so that much practice in telling time by hours may be given. Use a clock face with Arabic numerals. An old alarm clock will be found very useful in this work because both hands can be turned in the right positions by the set screw.

If the clock belonging to your room contains Roman numerals, a new face may be made with Arabic numerals and pasted over the other face.



1. Tell where the short hand points in each of these clocks. This hand is called the *hour hand* and tells what hour it is when the long hand points to 12. Tell the time shown by each of these clock faces.

The teacher should follow this work by dictating various times in hours and having the pupils indicate the different times on the clock faces which they have made, by using a long and a short stick for hands.

COUNTING BY 10'S TO 100



1. In what games have you heard the older children count, "Ten, twenty, thirty, forty, fifty, sixty, seventy, eighty, ninety, one hundred"?

2. Do you know how to count that way yourself? It is not hard to learn.

3. When a boy is "It" in hide-and-go-seek, he counts by 10's to 100 because it takes less time than to put in all the numbers. He counts, 10, 20, 30, 40, 50, and so on to 100. (See bottom row on number form on page 7.) If it takes quite a while for the children to hide, he may have to say, "1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, — Can you go on, —?"

4. — may hide while — counts by 10's to 100.

5. — may hide while — counts from 1 to 20 the long way.

6. You may be "It," —, if you can count from 20 to 40 while — hides.

7. —, hide while — counts from 60 to 75.

The teacher should supply names of various pupils in place of the blanks. Keep up this type of work until the pupils can start in at any point and count toward a larger number. Those who are "It" must be allowed to hunt the pupils who hide in order to have the real game element in this work. The game may be made more exciting by allowing several pupils to hide at the same time.

1. Walk across the front of your schoolroom, counting your steps as you walk. How many steps wide is it?

2. Walk from one end of the room to the other. How many steps long is the room?

3. How many steps is it from the front door of your schoolhouse to the front of the school yard?

4. How many steps long is the hall in your schoolhouse?

5. Mark with wet chalk along a crack in the floor. Show the part of it which you think would about equal 4 of your steps. Take 4 steps along the line to see how nearly right you are.

Such estimation, if rightly directed, affords valuable sense training. If conditions permit, take the children outdoors. Let them judge distances, then measure them by steps: Keep the distances within their ability to judge. From measuring distances by *steps*, it is very easy to introduce measuring with a recognized unit such as the *foot-rule*.

6. Instead of measuring the line with steps, let us measure it with this stick (a foot-rule). The line is how many sticks long?

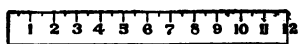
Have the pupil do the measuring, using marks at the end of the ruler to show the new measuring points.

7. How many sticks long is your schoolroom? The stick which you have been using is called a *foot-rule*—that is, it is a foot long. How many feet long is your schoolroom? How many feet wide is it?

8. How many feet wide is one of the windows?

9. Measure the width of the hall of your schoolhouse in feet.

USING THE INCH



Look at this picture of a foot-rule. The long marks drawn from the edge of the rule are inch marks. These marks are numbered 1, 2, 3, 4, 5, 6, and so on. How many inches are there in a foot?

Each pupil should be supplied with a rule (or a strip of cardboard properly marked off) containing only inch marks or one with both inch and half-inch divisions. A regular rule marked off into eighths or sixteenths is too confusing.

1 inch

2 inches

1. How long is the short line? Measure it with your rule. Put the left end of your rule at one end of the line and see which inch mark comes at the other end of the line.

2. How long is the other line?

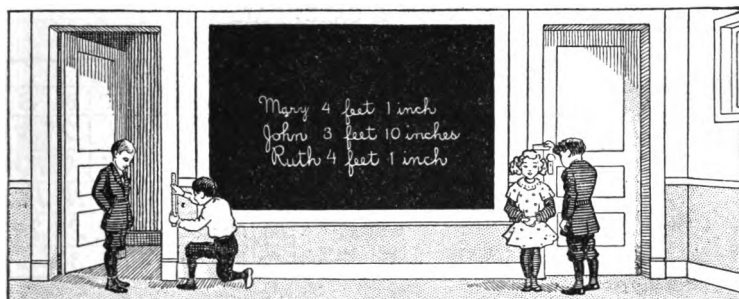
3. Lay your rule on a sheet of paper and draw a long line across the paper. Put the left end of your rule at one end of this line and make a cross mark 3 inches from the end:

3 inches

4. Draw 6 other lines and mark off these distances: 2 inches, 5 inches, 8 inches, 6 inches, 4 inches, 7 inches.

5. How many whole feet long is your desk? How many inches are left over? How long is your desk in feet and inches?

The teacher should extend this work in measurements as much as time permits, measuring the length and width of tables, windows, books, boxes, etc. Use only the nearest whole inch in these measurements.



HOW TALL ARE YOU?

1. Stand with your back to the edge of the door casing and have some other pupil hold a rule level on the top of your head.

2. The pupil holding the rule should make a light chalk mark on the door casing at the lower edge of the rule.

3. Place a foot-rule against the door casing with one end on the floor. Make a mark at the upper end and move the lower end of the rule up to this mark. Keep on measuring feet in this way until you have less than a foot left.

4. Measure the part less than a foot in inches.

5. How many feet and inches tall are you?

As in other work of this kind, the pupils are not expected to read these directions from the book. The teacher should read the directions and explain terms with which the pupils are not familiar, such as "door casing," "level," etc.

Instead of having the pupils stand against the door casing, a stick about five feet long may be placed back of the pupil and his height marked on this stick. The stick may then be laid on a table and the height can be much more conveniently measured. Have the pupils select the tallest and the shortest pupils in the class.

MAKING A CALENDAR

Furnish the pupils with squares of construction paper or bristol board 7 inches on each side. They will also need a rule marked off in inch divisions.

APRIL						
S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	

1. Lay off inch marks along two opposite edges of the card and draw the six cross lines.

2. Leave the top space vacant for the name of the month. Lay off inch marks along the first cross line below the top and also along the bottom. Draw in the cross lines joining these marks, dividing all the card except the top space into small squares.

3. Print the name of the month at the top and the initials of the days of the week along the top row of squares as shown in the picture of the calendar.

4. Fill in the numbers for the days. [The teacher should indicate the correct square for the first day of the month.]

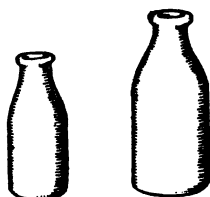
OPPORTUNITIES FOR COUNTING

There are excellent opportunities for counting in connection with construction work. How many are there in the class? Then have a pupil count out enough of these squares of cardboard so that he may give each pupil one square. Have another pupil count out enough rules so that he may give each pupil one. Another pupil may count and pass out the pencils if the pupils do not have their own pencils.

The teacher should utilize every opportunity of this sort to give practice in the practical side of number work. It also shows the pupils that they *need* these things to be efficient members of the class.

Pupils also enjoy counting races. Give each pupil 20 seconds and see *who can count the farthest*. Insist on clear enunciation of each number name.

PINTS AND QUARTS



1. Do you know how much milk the milkman leaves at your house each day?

2. Which is smaller, a pint or a quart bottle? Point each out in the picture.

3. Here are two measures which are sometimes used in selling milk. Which is the pint measure? Which is the quart?



4. Use the pint measure or pint bottle as a dipper and fill a quart measure or a quart bottle. How many pints make a quart?

The children can play milkman and measure pints and quarts. Let them see how many quarts or pints different pails and bottles contain.

5. You can find how many pints a pail holds by using a quart measure and counting by 2's. Count 2, 4, 6, 8, 10, 12, and so on.

Practice in counting by 2's may be given by writing all the numbers and making the ones used more prominent as shown in the following:

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

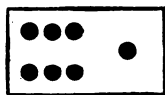
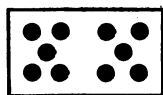
SENSING WEIGHT

1. Shut your eyes. Which stone is the heavier of these two? (Teacher should hand pupil two stones of different weights.)

2. Which is heavier, this stone or this block?

3. Which is heavier, this (half-gallon) pail filled with water or this (half-gallon) pail filled with sand?

Extend this work as much as time permits. Have pupils bring articles to school to use in comparing weights.

COMBINATIONS IN ADDITION¹

5 and 5 = ? 1 and 1 = ? 2 and 1 = ? 6 and 1 = ?

1. Answer the questions given below each group card by telling how many dots there are on each card.

The teacher should show that the sign = may be read either *are* or *equal*. 5 and 5 *are* 10 or 5 and 5 *equal* 10.

2. Sam spent 5 cents for marbles and 5 cents for candy. How many cents did he spend for both?

5 cents and 5 cents = ? cents.

3. ———², you have 1 pencil. If I give you 1 pencil, how many pencils will you then have?

1 pencil and 1 pencil = ? pencils.

4. How many are 2 cents and 1 cent?

5. An engineer has 6 cars in his train. If he couples 1 more car to his train, how many will he then have?

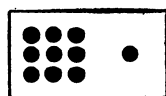
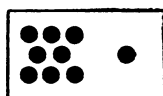
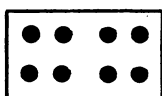
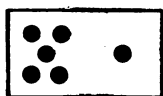
6 cars and 1 car = ? cars.

Chairs or blackboard erasers may be used to represent cars.

¹The combinations in addition are presented in the order of their difficulty as determined by individual tests with a large number of pupils, varying from the third grade to high-school graduates.

The domino cards are presented with each combination to make the work concrete. Illustrate each combination with other concrete work, such as groups of objects, pictures of objects, marks, etc. This drill with concrete material should be followed by the concrete problems based upon these combinations. The teacher should read the problem and have the pupil read merely the condensed statement following the problem, either from the book or from the blackboard.

²Where blanks occur in the text the teacher is expected to call the name of some pupil in the class.



5 and 1 = ? 4 and 4 = ? 8 and 1 = ? 9 and 1 = ?

1. How many fingers are there on one of your hands? When you hold up all the fingers on one hand and 1 on the other, how many fingers are up?

5 fingers and 1 finger = ? fingers.

2. If 8 children are "skipping the rope" and 1 more child comes to play with them, how many children are then playing together?

8 children and 1 child = ? children.

3. If I have 9 cents and my father gives me 1 cent more, how many cents do I have?

9 cents and 1 cent = ? cents.

4. —, you may be a milkman and empty this gallon measure full of "milk" (water) into these quart bottles. A gallon makes how many quarts? Two gallon measures hold how many quarts?



Quart



Gallon

4 quarts and 4 quarts = ? quarts.

If milk bottles cannot be obtained, any quart bottles, jars, or cans may be used. Working out an addition combination by means of an activity helps to fix the result more permanently.

The problems given in the text are merely suggestive. The teacher should supplement these lists and encourage pupils to make similar problems.

REVIEW

5 and 5 = 10 may also be written $5 + 5 = 10$.

The sign $+$ is used in place of the word *and*. When the sign $+$ is used between two numbers, it means to put them together to make one number. This number is called the *sum* of the two numbers. 10 is the sum of 5 and 5 when they are put together to make one number.

Give the sums of these numbers:

$1 + 1 = ?$	$5 + 1 = ?$	$9 + 1 = ?$
$6 + 1 = ?$	$8 + 1 = ?$	$1 + 5 = ?$
$4 + 4 = ?$	$1 + 6 = ?$	$1 + 8 = ?$
$2 + 1 = ?$	$1 + 2 = ?$	$1 + 9 = ?$

Show that 1 and 6 give the same sum as 6 and 1; 1 and 8 give the same sum as 8 and 1; etc.

5 These numbers may also be written one above
 5 the other and the sum written below the line as
 10 shown at the left.

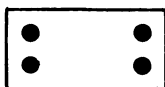
Give the sums of the numbers in this form:

$\begin{array}{r} 1 \\ 1 \\ \hline \end{array}$	$\begin{array}{r} 1 \\ 5 \\ \hline \end{array}$	$\begin{array}{r} 1 \\ 9 \\ \hline \end{array}$	$\begin{array}{r} 5 \\ 5 \\ \hline \end{array}$	$\begin{array}{r} 1 \\ 6 \\ \hline \end{array}$	$\begin{array}{r} 5 \\ 1 \\ \hline \end{array}$	$\begin{array}{r} 1 \\ 8 \\ \hline \end{array}$	$\begin{array}{r} 2 \\ 1 \\ \hline \end{array}$	$\begin{array}{r} 1 \\ 5 \\ \hline \end{array}$	$\begin{array}{r} 9 \\ 1 \\ \hline \end{array}$
$\begin{array}{r} 6 \\ 1 \\ \hline \end{array}$	$\begin{array}{r} 4 \\ 4 \\ \hline \end{array}$	$\begin{array}{r} 8 \\ 1 \\ \hline \end{array}$	$\begin{array}{r} 1 \\ 2 \\ \hline \end{array}$	$\begin{array}{r} 9 \\ 1 \\ \hline \end{array}$	$\begin{array}{r} 5 \\ 5 \\ \hline \end{array}$	$\begin{array}{r} 1 \\ 9 \\ \hline \end{array}$	$\begin{array}{r} 4 \\ 4 \\ \hline \end{array}$	$\begin{array}{r} 1 \\ 8 \\ \hline \end{array}$	$\begin{array}{r} 6 \\ 1 \\ \hline \end{array}$

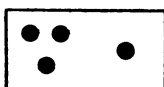
If a pupil cannot tell the correct sum of any combination from memory, have him turn back to the corresponding group card and find it. The big problem of the teacher is to furnish enough variety in the drill devices to prevent the pupils from tiring of this work before the number facts have been made thoroughly automatic.



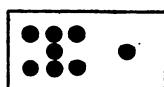
$$4 + 1 = ?$$



$$2 + 2 = ?$$



$$3 + 1 = ?$$



$$7 + 1 = ?$$

1. Give the sums of the two number groups on each card.

2. Bertha picked 7 roses from one bush and 1 rose from another. How many roses did she pick from both bushes?

$$7 \text{ roses} + 1 \text{ rose} = ? \text{ roses.}$$

3. How many rollers are there on the front of a roller skate? How many on the back? How many rollers are there on the skate?

$$2 \text{ rollers} + 2 \text{ rollers} = ? \text{ rollers.}$$

4. There were 3 boys around a bonfire and another boy joined the group. How many were there in the group then?

$$3 \text{ boys} + 1 \text{ boy} = ? \text{ boys.}$$

5. —, put 4 pieces of chalk on the table. —, put 1 more piece of chalk with the 4 pieces. How many pieces of chalk are there in the pile then?

$$4 \text{ pieces} + 1 \text{ piece} = ? \text{ pieces.}$$

6. — and — together have how many hands? How many feet? How many eyes?

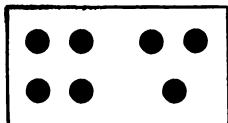
$$2 \text{ hands} + 2 \text{ hands} = ? \text{ hands.}$$

$$2 \text{ feet} + 2 \text{ feet} = ? \text{ feet.}$$

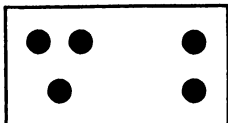
$$2 \text{ eyes} + 2 \text{ eyes} = ? \text{ eyes.}$$

Make constant use of the concrete material in your schoolroom to help fix these combinations. Use erasers, books, pegs, marbles, rulers, etc.

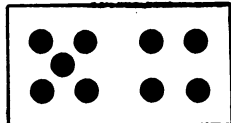
ADDITION COMBINATIONS



$$4 + 3 = ?$$



$$3 + 2 = ?$$



$$5 + 4 = ?$$

1. —, you may make a train of 4 chairs. — may couple 3 more on the train. How many chairs are now in the train?

$$4 \text{ chairs} + 3 \text{ chairs} = ? \text{ chairs.}$$

2. — may build a tower 3 blocks high. Now put 2 more blocks on the tower. How many blocks did you put in the tower?

$$3 \text{ blocks} + 2 \text{ blocks} = ? \text{ blocks.}$$

3. I saw 5 robins on the way to school and 4 robins on the way home. How many did I see on both trips?

$$5 \text{ robins} + 4 \text{ robins} = ? \text{ robins.}$$

4. David found 3 eggs in the barn and 4 eggs in the chicken house. How many did he find altogether?

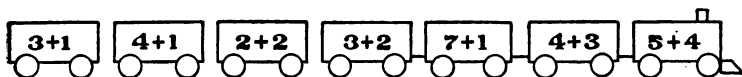
$$3 \text{ eggs} + 4 \text{ eggs} = ? \text{ eggs.}$$

5. — may take 2 pencils from this box. — may take 3 pencils. How many pencils have both taken from the box?

$$2 \text{ pencils} + 3 \text{ pencils} = ? \text{ pencils.}$$

6. John wished to tell Edward how many problems he had worked, but could not talk out loud. So he held up 4 fingers on one hand and 5 fingers on the other hand. Can you tell how many he had worked?

$$4 \text{ fingers} + 5 \text{ fingers} = ? \text{ fingers.}$$



TRAIN OF CARS

Write the combinations in rectangles drawn on the blackboard so that they represent cars. Wheels may be added to make them appear more like cars. The game is to see how many cars a child can couple to his engine in a certain time. When he gives a combination correctly, he may draw a line between that "car" and the last one of his train. Another child may see how quickly he can "uncouple the cars," saying the combinations and erasing the marks used to join the cars into a train.

REVIEW

Give the missing number (in place of the question mark) which put with the other numbers will make the sum below the line:

?	1	3	?	?	5	?	4	?	5
3	?	?	2	4	?	3	?	4	?
<u>4</u>	<u>8</u>	<u>7</u>	<u>4</u>	<u>5</u>	<u>9</u>	<u>5</u>	<u>5</u>	<u>7</u>	<u>10</u>
?	?	1	5	2	?	3	1	?	1
1	4	?	?	?	4	?	?	5	?
<u>3</u>	<u>8</u>	<u>9</u>	<u>6</u>	<u>5</u>	<u>9</u>	<u>4</u>	<u>5</u>	<u>10</u>	<u>8</u>

CLIMBING THE LADDER

Another game which may be used for drill on these combinations is *Climbing the Ladder*. The combinations are written on the steps of the picture of a ladder drawn on the blackboard. The pupils see who can climb the highest without falling off (missing a combination). Change the combinations from day to day in order to give drill in all of the combinations.

REVIEW PROBLEMS

1. How many fingers do you have on each hand?
How many do you have on both hands?

$$5 \text{ fingers} + 5 \text{ fingers} = ? \text{ fingers.}$$

2. A nickel is worth 5 pennies. A nickel and 1 penny are equal to how many pennies?

$$5 \text{ pennies} + 1 \text{ penny} = ? \text{ pennies.}$$

3. I had 7 candles on my birthday cake. John is 1 year older than I am. How many candles did he have on his birthday cake?

$$7 \text{ candles} + 1 \text{ candle} = ? \text{ candles.}$$

4. A nickel equals 5 cents. 2 nickels are equal to how many cents?

$$5 \text{ cents} + 5 \text{ cents} = ? \text{ cents.}$$

5. There are 4 in our family. If 3 guests come for dinner, how many pieces of pie must be cut to serve our family and the guests?

$$4 \text{ pieces} + 3 \text{ pieces} = ? \text{ pieces.}$$

6. There were 5 boys and 4 girls at my birthday party. How many apples did I need to serve everyone at the party?

$$5 \text{ children} + 4 \text{ children} = ? \text{ children.}$$

(I needed as many apples as there were children at the party.)

7. My father has two boats, and each boat has four oars. How many oars do both boats have?

$$4 \text{ oars} + 4 \text{ oars} = ? \text{ oars.}$$

Have the pupils suggest original problems involving the combinations which have already been learned.

JACK HORNER'S PIE

The "plums" for Jack Horner's Christmas pie are cards about 4" by 6" on which are written the addition combinations which have been studied up to this time. These "plums" are buried in the sand, and only a corner is left sticking out to show where they are hidden.



The children go to the pie, pull out a "plum," and tell the answers to the combinations on the cards.

DRILL A

Pupils should practice on this exercise until they can give all of the sums quickly and accurately:

<u>4</u>	<u>9</u>	<u>3</u>	<u>8</u>	<u>1</u>	<u>4</u>	<u>1</u>	<u>1</u>	<u>3</u>	<u>4</u>
<u>5</u>	<u>1</u>	<u>4</u>	<u>1</u>	<u>3</u>	<u>4</u>	<u>4</u>	<u>8</u>	<u>2</u>	<u>3</u>

<u>1</u>	<u>6</u>	<u>1</u>	<u>2</u>	<u>5</u>	<u>3</u>	<u>2</u>	<u>5</u>	<u>5</u>	<u>1</u>
<u>5</u>	<u>1</u>	<u>1</u>	<u>2</u>	<u>5</u>	<u>1</u>	<u>3</u>	<u>1</u>	<u>4</u>	<u>7</u>

<u>2</u>	<u>1</u>	<u>4</u>	<u>5</u>	<u>7</u>	<u>1</u>	<u>4</u>	<u>2</u>	<u>1</u>	<u>1</u>
<u>1</u>	<u>9</u>	<u>1</u>	<u>5</u>	<u>1</u>	<u>2</u>	<u>4</u>	<u>2</u>	<u>6</u>	<u>1</u>

Drill work in the lower grades should be largely oral so that the teacher can note any wrong associations and correct them before they are fixed incorrectly. This drill should be placed on the blackboard and used for daily drill, the combinations written on flash cards and flashed before the pupils, and other devices used to provide the necessary drill without making it monotonous.

SUBTRACTION FACTS I

5 and ? = 9. If we take 5 away from 9, how many are left? If we take 4 away from 9, how many are left?

The group card on page 20 may be well used here. Cover up the 5 group of the 9 card, how many are left? Cover up only the 4 group, how many are left?

When we take one number from another, we say we *subtract*. The number that is left is called the *remainder*.

The sign $-$ means to subtract and is read *less* or *take away*. $9 - 5$ means 9 less 5, which equals 4.

Fill in the missing numbers:

$3 + ? = 7$	$4 + ? = 8$	$2 + ? = 5$
$7 - 3 = ?$	$8 - 4 = ?$	$5 - 2 = ?$
$6 + ? = 7$	$4 + ? = 5$	$2 + ? = 4$
$7 - 6 = ?$	$5 - 4 = ?$	$4 - 2 = ?$

Subtract: Subtraction problems may also be written with one number above the other as in the addition form. In subtracting we take the lower number from the upper number. In the problem at the left we can find the remainder by asking, "What number added to 4 will make 9?" The answer is 5.

Then 9 less 4 = 5. Always think of the addition combination in learning a subtraction fact.

Subtract:

$\begin{array}{r} 9 \\ 5 \\ \hline \end{array}$	$\begin{array}{r} 10 \\ 1 \\ \hline \end{array}$	$\begin{array}{r} 8 \\ 4 \\ \hline \end{array}$	$\begin{array}{r} 9 \\ 1 \\ \hline \end{array}$	$\begin{array}{r} 4 \\ 3 \\ \hline \end{array}$	$\begin{array}{r} 5 \\ 4 \\ \hline \end{array}$	$\begin{array}{r} 4 \\ 4 \\ \hline \end{array}$	$\begin{array}{r} 9 \\ 8 \\ \hline \end{array}$	$\begin{array}{r} 5 \\ 2 \\ \hline \end{array}$	$\begin{array}{r} 7 \\ 3 \\ \hline \end{array}$	$\begin{array}{r} 5 \\ 5 \\ \hline \end{array}$
$\begin{array}{r} 6 \\ 5 \\ \hline \end{array}$	$\begin{array}{r} 7 \\ 1 \\ \hline \end{array}$	$\begin{array}{r} 1 \\ 1 \\ \hline \end{array}$	$\begin{array}{r} 3 \\ 2 \\ \hline \end{array}$	$\begin{array}{r} 7 \\ 6 \\ \hline \end{array}$	$\begin{array}{r} 4 \\ 4 \\ \hline \end{array}$	$\begin{array}{r} 2 \\ 2 \\ \hline \end{array}$	$\begin{array}{r} 6 \\ 1 \\ \hline \end{array}$	$\begin{array}{r} 9 \\ 4 \\ \hline \end{array}$	$\begin{array}{r} 8 \\ 7 \\ \hline \end{array}$	$\begin{array}{r} 3 \\ 0 \\ \hline \end{array}$

Give the missing numbers in these subtraction problems:

$\begin{array}{r} 10 \\ 9 \\ \hline ? \end{array}$	$\begin{array}{r} 8 \\ ? \\ \hline 4 \end{array}$	$\begin{array}{r} 7 \\ ? \\ \hline 1 \end{array}$	$\begin{array}{r} 9 \\ 5 \\ \hline ? \end{array}$	$\begin{array}{r} ? \\ 5 \\ \hline 1 \end{array}$	$\begin{array}{r} 3 \\ ? \\ \hline 2 \end{array}$	$\begin{array}{r} 8 \\ 1 \\ \hline ? \end{array}$	$\begin{array}{r} ? \\ 1 \\ \hline 4 \end{array}$	$\begin{array}{r} 3 \\ ? \\ \hline 1 \end{array}$	$\begin{array}{r} 2 \\ 1 \\ \hline ? \end{array}$
$\begin{array}{r} ? \\ 4 \\ \hline 3 \end{array}$	$\begin{array}{r} 9 \\ ? \\ \hline 1 \end{array}$	$\begin{array}{r} 5 \\ 2 \\ \hline ? \end{array}$	$\begin{array}{r} ? \\ 2 \\ \hline 2 \end{array}$	$\begin{array}{r} 7 \\ ? \\ \hline 4 \end{array}$	$\begin{array}{r} 9 \\ 4 \\ \hline ? \end{array}$	$\begin{array}{r} 6 \\ 1 \\ \hline ? \end{array}$	$\begin{array}{r} ? \\ 5 \\ \hline 5 \end{array}$	$\begin{array}{r} 4 \\ ? \\ \hline 1 \end{array}$	$\begin{array}{r} ? \\ 3 \\ \hline 2 \end{array}$

SUBTRACTION PROBLEMS

1. Mary, Ethel, and Jane were making a seven-room play house in the leaves. When they had made 4 rooms, how many had they left to make?

$$7 \text{ rooms} - 4 \text{ rooms} = ? \text{ rooms.}$$

2. The cook gave the three girls 4 potatoes to roast. They burned 1 of them. How many did they have left to eat?

$$4 \text{ potatoes} - 1 \text{ potato} = ? \text{ potatoes.}$$

3. Josephine has 4 paper dolls to cut out of a paper. When she has cut out 2, how many are still uncut?

$$4 \text{ dolls} - 2 \text{ dolls} = ? \text{ dolls.}$$

4. A man gave Dorothy 10 pennies and she spent 5 of them for candy. How many pennies did she have left?

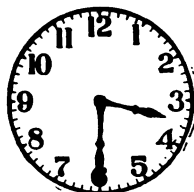
$$10 \text{ pennies} - 5 \text{ pennies} = ? \text{ pennies.}$$

5. Jane earned 5 cents drying dishes and spent 3 cents. How many cents had she left?

$$5 \text{ cents} - 3 \text{ cents} = ? \text{ cents.}$$

In drilling with the group cards, have the pupils give the subtraction facts as well as the addition combinations.

WHAT OUR SCHOOL CLOCK SAYS

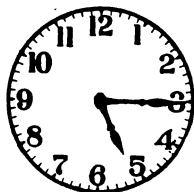
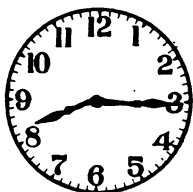
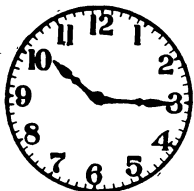


1. Where is the short hand or *hour hand* in the first clock face? Where is the long hand or *minute hand*?

When the hour hand is halfway between 2 and 3 and the minute hand is at 6, we say it is *half past two*.

2. The middle clock face shows that it is *half past nine*. What time is it by the third clock face?

3. Draw clock faces to show: half past one; half past ten; half past four; half past seven; half past eleven; half past five; half past twelve; half past six.



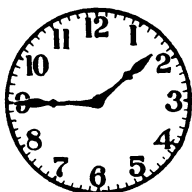
4. When the hour hand is a short distance past the 10 and the minute hand is at 3, we say the time is *a quarter past ten*. What time is it by the first clock face in the middle of the page?

5. The second clock shows *a quarter past eight*.

6. What time is it by the third clock face?

Have pupils fold paper circles into 2 equal parts and crease down the middle. Each part is called a *half*. Show that the minute hand is half way around the clock face when it is at 6. Show the meaning of *quarter* by folding into 4 equal parts.

7. Draw clock faces to show a quarter past six; a quarter past twelve; a quarter past nine; a quarter past seven; a quarter past one; a quarter past five; a quarter past two.



8. If the hour hand is almost to the 5 and the minute hand is at the 9, we say that it is *a quarter to five*. What time is it by the first clock face?

9. The second clock face shows *a quarter to two*.

10. What time does the third clock face show?



A



B



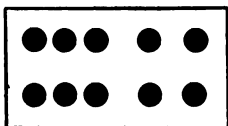
C

11. What time does clock face A show?

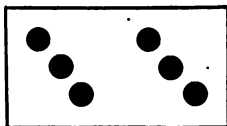
12. What time is it by clock B? By clock C?

The teacher should have a clock face with hour and minute hands and give much practice on telling time by half and quarter hours. The work in telling time by minutes in multiples of five is taken up on page 38. Pupils tire of the work on the clock if it is all given at once. Motivate the work on telling time by asking the time at various intervals during the day.

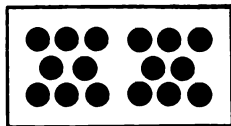
ADDITION COMBINATIONS



$$6 + 4 = ?$$



$$3 + 3 = ?$$



$$8 + 8 = ?$$

1. A dairyman has 6 cows in one pasture and 4 in another. How many cows does he have in both pastures?

$$6 \text{ cows} + 4 \text{ cows} = ? \text{ cows.}$$

2. A yardstick is 3 feet long. Place two yardsticks end to end. How long are they together?

$$3 \text{ feet} + 3 \text{ feet} = ? \text{ feet.}$$

3. —, you may fill this peck measure by using the quart measure. How many quarts make a peck? How many quarts are there in two pecks?

$$8 \text{ quarts} + 8 \text{ quarts} = ? \text{ quarts.}$$



Peck Measure



Quart

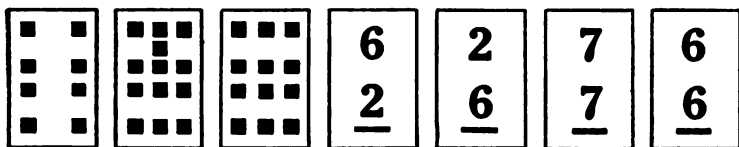
4. Alice bought 4 Christmas cards in one store and 6 in another. How many did she buy in both stores?

$$4 \text{ cards} + 6 \text{ cards} = ? \text{ cards.}$$

5. What things are usually measured in peck measures? In quart measures?

$$6. \quad 3 \text{ pecks} + 3 \text{ pecks} = ? \text{ pecks.}$$

New facts should be presented in a concrete way. The pupils may use measures, objects, draw pictures of the objects, make a mark to stand for each object, etc., to find the sum of the new combination. Then drill by flash cards, games, number drills on the blackboard, concrete problems, etc., to fix each fact in the child's memory thoroughly.



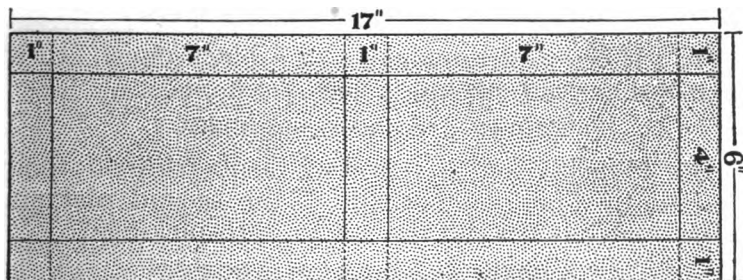
MAKING FLASH CARDS

Have the pupils cut cheap, light-weight cardboard into 6" by 4" oblongs. Have them paste $\frac{1}{2}$ " squares of colored paper or $\frac{1}{2}$ " red adhesive seals in the various groups shown in the text from pages 16 to 45.

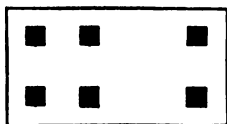
These group cards should be followed by cards containing the number symbols representing the groups. Make the figures with a printing outfit or by writing with marking crayon.

Group work by the pupils: Divide the class into groups of two. One pupil may flash his cards, one at a time for an instant before the other pupil, who will give the sums of the groups. The sums should be written in small figures on the backs of the cards so that the pupil flashing the cards may check the answers of his classmate who is giving them. Have the pupils correct immediately any incorrect answers.

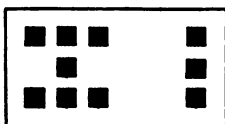
Have the children make a box with a cover to hold their sets of group cards. In the following pattern cut on the dotted lines, fold on the solid inside lines, and fasten the corners together.



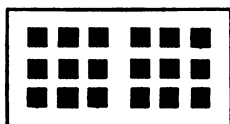
ADDITION COMBINATIONS



$$4 + 2 = ?$$



$$7 + 3 = ?$$



$$9 + 9 = ?$$

Give the sums of these numbers:

6	3	8	2	7	4	6	6	3	2
4	3	8	6	7	6	6	2	7	4
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
9	4	7	8	7	3	9	3	7	9
9	2	3	8	7	7	9	3	3	9
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>

1. Paul and Fred wish to buy some candy. Paul says he has 7 cents and Fred says he has 3 cents. How many cents worth can they buy if they spend all of their pennies?

$$7 \text{ cents and } 3 \text{ cents} = ? \text{ cents.}$$

2. A gallon is equal to 4 quarts. How many quarts of milk are there in a gallon and 2 quarts?

$$4 \text{ quarts} + 2 \text{ quarts} = ? \text{ quarts.}$$

3. There are 9 players in a baseball team. How many boys does it take to make two baseball teams?

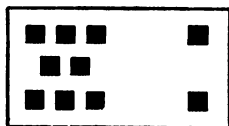
$$9 \text{ players} + 9 \text{ players} = ? \text{ players.}$$

4. Alice has 2 tan shoes and 4 black ones. How many shoes of both kinds does she have?

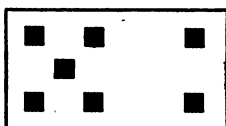
$$2 \text{ shoes} + 4 \text{ shoes} = ? \text{ shoes.}$$

5. Ethel picked 3 boxes of raspberries off their patch the first picking, and 7 the second picking. How many boxes did she get in both pickings?

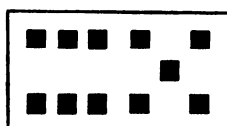
$$3 \text{ boxes} + 7 \text{ boxes} = ? \text{ boxes.}$$



$$8 + 2 = ?$$



$$5 + 2 = ?$$



$$6 + 5 = ?$$

1. Take 2 pieces of chalk in one hand and 5 in the other hand. Place them all together in one hand. How many are there?

$$2 \text{ pieces} + 5 \text{ pieces} = ? \text{ pieces.}$$

2. —, if you have 8 cents in your purse and put in 2 more, how many cents do you then have in your purse?

$$8 \text{ cents} + 2 \text{ cents} = ? \text{ cents.}$$

3. An old hen has 6 white chicks and 5 black ones. How many chicks does she have altogether?

$$6 \text{ chicks} + 5 \text{ chicks} = ? \text{ chicks.}$$

4. George spent 5 cents for postal cards and 2 cents for stamps. How much did he spend for both cards and stamps?

$$5 \text{ cents} + 2 \text{ cents} = ? \text{ cents.}$$

5. A nickel equals how many cents? A nickel and 6 cents equal how many cents?

$$5 \text{ cents} + 6 \text{ cents} = ? \text{ cents.}$$

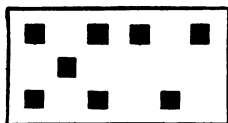
6. Lay 2 pegs in one pile. Lay 8 pegs in another pile. How many pegs are there in both piles?

$$2 \text{ pegs} + 8 \text{ pegs} = ? \text{ pegs.}$$

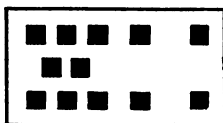
7. Elizabeth spent 5 cents for a valentine and 2 cents for a stamp with which to send it. How many cents did she spend for both?

$$5 \text{ cents} + 2 \text{ cents} = ? \text{ cents.}$$

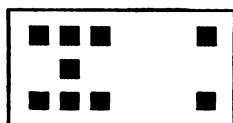
ADDITION COMBINATIONS



$$5 + 3 = ?$$



$$8 + 4 = ?$$



$$7 + 2 = ?$$

1. Ellen spent 5 cents for a pencil and 3 cents for a picture postal. How many cents did she spend for both?

$$5 \text{ cents} + 3 \text{ cents} = ? \text{ cents.}$$

2. Martha cut a small pie into 3 pieces and a large pie into 5 pieces. How many people could she serve with the two pies cut in those parts?

$$3 \text{ pieces} + 5 \text{ pieces} = ? \text{ pieces.}$$

3. Dorothy has 8 red tulips and 4 yellow ones in bloom. How many tulips of both kinds are in bloom?

$$8 \text{ tulips} + 4 \text{ tulips} = ? \text{ tulips.}$$

4. There are 7 bananas in a dish on the table. Emma put in 2 more before passing them to her playmates. How many did she then have in her dish?

$$7 \text{ bananas} + 2 \text{ bananas} = ? \text{ bananas.}$$

5. There are 8 windows in our house in the first story and 4 windows in the second story. How many screens will we need to screen all the windows?

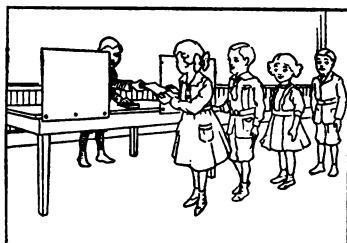
$$8 \text{ windows} + 4 \text{ windows} = ? \text{ windows.}$$

6. Arthur's mother bought him a hat costing 2 dollars and one for herself costing 7 dollars. How much did both hats cost?

$$2 \text{ dollars} + 7 \text{ dollars} = ? \text{ dollars.}$$

POST OFFICE

Combinations on flash cards are the letters. The children pass in front of the post office window. If a child gives the correct answer he gets his "letter" and passes on. If he gives the wrong sum or hesitates too long the postmaster says, "Next," and he must pass on without a letter for that trip. After a certain number of trips, the one with the most letters wins. Sometimes the teacher and at other times a child may be the postmaster.



WHAT HAVE YOU?

Give each child a combination card blank side up. The teacher, speaking to the first child, asks: "What have you?" The child turns over his card and answers: "I have 8 and 4 are 12." He in turn asks the child behind him, and so on.

The cards may be collected after each has recited and redistributed for another round.

Use these and other games to drill on the facts in the following exercise:

DRILL B

<u>4</u>	<u>3</u>	<u>7</u>	<u>8</u>	<u>6</u>	<u>7</u>	<u>4</u>	<u>9</u>	<u>8</u>	<u>6</u>
<u>6</u>	<u>3</u>	<u>3</u>	<u>8</u>	<u>2</u>	<u>7</u>	<u>2</u>	<u>9</u>	<u>2</u>	<u>6</u>
<u>2</u>	<u>4</u>	<u>2</u>	<u>6</u>	<u>3</u>	<u>3</u>	<u>2</u>	<u>5</u>	<u>6</u>	<u>9</u>
<u>6</u>	<u>8</u>	<u>4</u>	<u>5</u>	<u>3</u>	<u>7</u>	<u>5</u>	<u>3</u>	<u>4</u>	<u>9</u>
<u>5</u>	<u>7</u>	<u>2</u>	<u>6</u>	<u>3</u>	<u>8</u>	<u>2</u>	<u>5</u>	<u>7</u>	<u>8</u>
<u>6</u>	<u>2</u>	<u>8</u>	<u>6</u>	<u>5</u>	<u>4</u>	<u>7</u>	<u>2</u>	<u>7</u>	<u>8</u>

Drill B should be placed on the blackboard and used daily until the pupils can say the sums as rapidly as they can those in Drill A. (See page 23.)

MEASURING WITH THE YARDSTICK

Review work in measuring lengths on page 11.

You have found how many feet long your room is. It is easier to measure the length of a room with a longer stick such as this. (Show a yardstick.) Why?

This stick is called a *yardstick* because it is a yard long. Perhaps you have heard of some things which we buy at the store at so much *per yard*. What things are sold *by the yard* at the store?

1. Find how many yards wide your room is.
2. Find how many yards long it is.
3. Measure the length and width of the hall of your schoolhouse in yards.
4. Lay foot-rulers along a yardstick. A yardstick is how many feet long?
5. How many feet long are two yardsticks placed end to end? $3 \text{ feet} + 3 \text{ feet} = ? \text{ feet}$.

COUNTING BY 3'S

1. Use the counting chart (page 7) to find a number 3 more than 3; 3 more than 6; 3 more than 9; 3 more than 12; 3 more than 15; 3 more than 18; 3 more than 21; 3 more than 24; 3 more than 27.
2. Count by 3's to 30, so—1, 2, **3**, 4, 5, **6**, 7, 8, **9**, 10, 11, **12**, 13, 14, **15**, 16, 17, **18**, 19, 20, **21**, 22, 23, **24**, 25, 26, **27**, 28, 29, **30**. Bring out the heavy black numbers louder.
3. Learn to leave out the other numbers and just say—3, 6, 9, 12, 15, 18, 21, 24, 27, 30.

You can now use a yardstick and still measure in feet. When you measure off one yard say 3 feet; when you measure off another say 6 feet; another 9 feet; and so on, counting by 3's.

NICKELS AND DIMES

1. What can you buy for a cent?
2. Which would you rather have, a nickel or a cent? A nickel is equal to how many cents?
3. A man gave his two children 5 cents each. He found 5 pennies for Louise, but that took all his pennies. What did he give James instead?
4. Two nickels are equal to a dime. 5 cents and 5 cents are how many cents? A dime is equal to how many cents?
5. Percy saved a nickel and 3 cents. That was equal to how many cents?
6. Richard earned a nickel and 4 cents. That equals how many cents?
7. Play that you have 10 nickels and you want to find how much money you have. Count by 5's in this way: 5, 10, 15, 20, 25, 30, 35, 40, 45, 50. Use real or toy nickels in your counting.

COUNTING BY 4'S

1. Show a gallon with quart milk bottles. How many quarts in a gallon? (See page 17.) 2 gallons equal how many quarts? (Measures may be used instead of bottles.)
2. Place 4 more quart bottles in a line with the 8.
 $8 \text{ quarts} + 4 \text{ quarts} = ? \text{ quarts.}$
3. Count all the bottles. As you reach the end of each gallon, speak louder: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12.
4. Write all the numbers from 1 to 40, making every fourth number heavier. Count by 4's to 40.

SUBTRACTION FACTS II

Drill on the following subtraction facts until the pupils can give them rapidly and accurately. Use the addition facts in learning the subtraction facts by recalling what number added to the lower number makes the upper number.

Subtract:

$\begin{array}{r} 10 \\ 6 \\ \hline \end{array}$	$\begin{array}{r} 6 \\ 3 \\ \hline \end{array}$	$\begin{array}{r} 10 \\ 3 \\ \hline \end{array}$	$\begin{array}{r} 8 \\ 8 \\ \hline \end{array}$	$\begin{array}{r} 8 \\ 2 \\ \hline \end{array}$	$\begin{array}{r} 14 \\ 7 \\ \hline \end{array}$	$\begin{array}{r} 6 \\ 2 \\ \hline \end{array}$	$\begin{array}{r} 18 \\ 9 \\ \hline \end{array}$	$\begin{array}{r} 10 \\ 2 \\ \hline \end{array}$	$\begin{array}{r} 12 \\ 6 \\ \hline \end{array}$
$\begin{array}{r} 8 \\ 6 \\ \hline \end{array}$	$\begin{array}{r} 12 \\ 8 \\ \hline \end{array}$	$\begin{array}{r} 6 \\ 4 \\ \hline \end{array}$	$\begin{array}{r} 11 \\ 5 \\ \hline \end{array}$	$\begin{array}{r} 3 \\ 3 \\ \hline \end{array}$	$\begin{array}{r} 10 \\ 7 \\ \hline \end{array}$	$\begin{array}{r} 7 \\ 5 \\ \hline \end{array}$	$\begin{array}{r} 8 \\ 3 \\ \hline \end{array}$	$\begin{array}{r} 10 \\ 4 \\ \hline \end{array}$	$\begin{array}{r} 9 \\ 9 \\ \hline \end{array}$
$\begin{array}{r} 11 \\ 6 \\ \hline \end{array}$	$\begin{array}{r} 9 \\ 2 \\ \hline \end{array}$	$\begin{array}{r} 10 \\ 8 \\ \hline \end{array}$	$\begin{array}{r} 6 \\ 6 \\ \hline \end{array}$	$\begin{array}{r} 8 \\ 5 \\ \hline \end{array}$	$\begin{array}{r} 12 \\ 4 \\ \hline \end{array}$	$\begin{array}{r} 9 \\ 7 \\ \hline \end{array}$	$\begin{array}{r} 7 \\ 2 \\ \hline \end{array}$	$\begin{array}{r} 7 \\ 7 \\ \hline \end{array}$	$\begin{array}{r} 16 \\ 8 \\ \hline \end{array}$

SUBTRACTION PROBLEMS

1. There were 8 children skipping the rope. 2 came in at the first bell. How many were left?

$$8 \text{ children} - 2 \text{ children} = ? \text{ children.}$$

2. Everett earned 10 cents for weeding the pansy bed. He spent 6 cents buying marbles. How many cents did he have left?

$$10 \text{ cents} - 6 \text{ cents} = ? \text{ cents.}$$

3. There were 6 eggs in the ice chest. Mother used 2 for making cookies. How many were left?

$$6 \text{ eggs} - 2 \text{ eggs} = ? \text{ eggs.}$$

4. Franklin picked up 7 stones beside the lake and threw 5 of them in. How many had he left?

$$7 \text{ stones} - 5 \text{ stones} = ? \text{ stones.}$$

5. When one takes 3 cents from 8 cents, how many cents are left?

$$8 \text{ cents} - 3 \text{ cents} = ? \text{ cents.}$$

6. Marion's father gave her 12 tulip bulbs for her garden. 4 were yellow. The rest were red. How many red tulip bulbs did she have?

$$12 \text{ tulips} - 4 \text{ tulips} = ? \text{ tulips.}$$

7. Roger is 7 years old. His sister is 2 years younger. How old is she?

$$7 \text{ years} - 2 \text{ years} = ? \text{ years.}$$

8. There were 11 people in an elevator and 5 got off at one floor. How many were left on the elevator?

$$11 \text{ people} - 5 \text{ people} = ? \text{ people.}$$

9. John's father had 14 pennies. He gave John 7 of them and Alice the others. How many did she receive?

$$14 \text{ pennies} - 7 \text{ pennies} = ? \text{ pennies.}$$

10. Eighteen baseball players were practicing in the park. 9 of them went home. How many were left?

$$18 \text{ players} - 9 \text{ players} = ? \text{ players.}$$

REVIEW

Give the missing numbers in these subtraction problems:

10	?	11	8	?	7	16	?	11	14
<u>?</u>	<u>2</u>	<u>5</u>	<u>?</u>	<u>4</u>	<u>2</u>	<u>?</u>	<u>2</u>	<u>6</u>	<u>?</u>
6	7	?	3	8	?	8	4	?	7
8	3	10	9	6	?	12	7	18	12
<u>?</u>	<u>3</u>	<u>?</u>	<u>7</u>	<u>?</u>	<u>2</u>	<u>?</u>	<u>?</u>	<u>9</u>	<u>?</u>
2	?	3	?	3	6	4	0	?	6
10	6	10	8	?	?	4	8	?	5
<u>6</u>	<u>?</u>	<u>?</u>	<u>8</u>	<u>4</u>	<u>3</u>	<u>?</u>	<u>4</u>	<u>4</u>	<u>2</u>
?	2	8	?	5	7	2	?	3	?

TELLING TIME



1. Notice the small spaces around the edge of the clock face. How many are there between the 12 and the 1? How many between the 12 and the 2? How many between the 12 and the 3? Between the 11 and the 12?

2. Begin at the 12 and count by 5's as you go around the clock face, saying **5** at the 1, **10** at the 2, **15** at the 3, and so on until the 6 is reached.

3. Begin at the 12 and count by 5's as you go to the left, saying **5** at the 11, **10** at the 10, **15** at the 9, and so on until the 7 is reached.

These little spaces are called *minute spaces*. When the minute hand is at 1 and the hour hand is a short distance past the 12, we say the time is *5 minutes after 12*. The first clock face shows 5 minutes after 12.

4. What time is it by the second clock face?

5. How many minutes after 12 does the third clock face show? We also say it is a *quarter past 12* for this time. Either way is right.

6. Where is the minute hand at 20 minutes after 12; at 25 minutes after 12; at 30 minutes after 12?

7. What other way may we read the time for 30 minutes after 12? (See page 26.)



1. How many minute spaces between the 11 and the 12? When the minute hand is at 11 and the hour hand is nearly to 2, we say it is 5 minutes to 2.
2. Where are the two hands at 10 minutes to 2?
3. Where are the two hands at 15 minutes to 2? In what other way can we tell this same time?
4. Where will the minute hand be when it is 20 minutes to 2? When it is 25 minutes to 2?

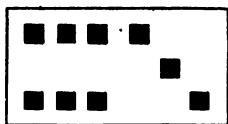
COUNTING MORE THAN A HUNDRED

If you tried to count the number of people at a big picnic, after you had reached 100, you would say 101 (one hundred one), 102, 103, 104, 105, 106, 107, 108, 109, 110 (one hundred ten), 111, 112, 113, 114, 115, 116, 117, 118, 119, 120 (one hundred twenty), 121, 122, and so on up to 200.

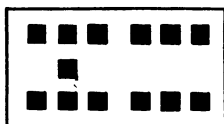
1. Count from 100 to 200; from 200 to 300; from 300 to 400, and so on up to 999.
2. The next number after 999 is *one thousand* and is written 1000.
3. The number on my friend's house is 1004 Main Street. It is read *one thousand four, Main Street*.
4. If you live in a city, copy the number of your house on a sheet of paper and see if the class can read it.

Other numbers that may be used in this work are automobile numbers, telephone numbers, railroad ticket numbers, etc.

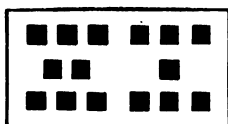
ADDITION COMBINATIONS



$$6 + 3 = ?$$



$$7 + 6 = ?$$



$$8 + 7 = ?$$

1. Harry sold 6 papers in one store and 3 papers in another. How many papers did he sell in both stores?

$$6 \text{ papers} + 3 \text{ papers} = ? \text{ papers.}$$

2. There are 6 oak trees and 7 maple trees in a grove. How many trees of both kinds are there in the grove?

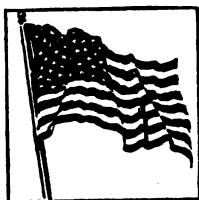
$$6 \text{ trees} + 7 \text{ trees} = ? \text{ trees.}$$

3. Mary counted 8 cars in front of the city hall and 7 cars at the side entrance. How many cars were there altogether?

$$8 \text{ cars} + 7 \text{ cars} = ? \text{ cars.}$$

4. Our flag has 7 red stripes and 6 white stripes. How many stripes of both colors has it?

$$7 \text{ stripes} + 6 \text{ stripes} = ? \text{ stripes.}$$



5. There are 6 boys and 3 girls playing at the sand table. How many children are there at the sand table?

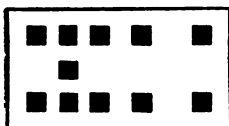
$$6 \text{ children} + 3 \text{ children} = ? \text{ children.}$$

6. Harold has 7 goldfish and 8 other fish in his fish pool. How many fish has he altogether?

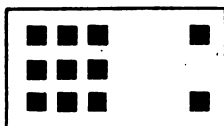
$$7 \text{ fish} + 8 \text{ fish} = ? \text{ fish.}$$

7. Ellen bought 6 pieces of fudge and 7 pieces of taffy. How many pieces of candy did she buy?

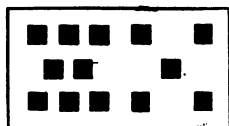
$$6 \text{ pieces} + 7 \text{ pieces} = ? \text{ pieces.}$$



$$7 + 4 = ?$$



$$9 + 2 = ?$$



$$8 + 5 = ?$$

1. Elmer rode his bicycle 8 miles on Saturday morning and 5 miles on Saturday afternoon. How many miles did he ride during the day?

$$8 \text{ miles} + 5 \text{ miles} = ? \text{ miles.}$$

2. Josephine picked 7 boxes of currants and 4 boxes of gooseberries for her mother. How many boxes of both kinds of fruit did she pick?

$$7 \text{ boxes} + 4 \text{ boxes} = ? \text{ boxes.}$$

3. Make a train of 9 chairs. Now couple 2 more chairs to the train. How many chairs in the train now?

$$9 \text{ chairs} + 2 \text{ chairs} = ? \text{ chairs.}$$

4. There are 5 children in one group on the playground and 8 children in another group. How many pieces of candy must I have to give each child a piece?

$$5 \text{ pieces} + 8 \text{ pieces} = ? \text{ pieces.}$$

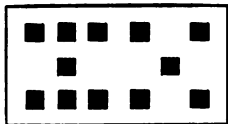
5. Draw a line 7 inches long. From the end of this line draw a line 4 inches long. How long are the two lines together?

$$7 \text{ inches} + 4 \text{ inches} = ? \text{ inches.}$$

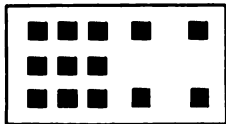
6. It is 9 blocks from our house to the schoolhouse and 2 blocks more from the schoolhouse to the park. How far is it from our house to the park?

$$9 \text{ blocks} + 2 \text{ blocks} = ? \text{ blocks.}$$

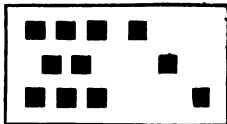
ADDITION COMBINATIONS



$$7 + 5 = ?$$



$$9 + 4 = ?$$



$$8 + 3 = ?$$

1. Eight boys are playing "Blackman" and 3 more join them. How many boys are then playing in the game?

$$8 \text{ boys} + 3 \text{ boys} = ? \text{ boys.}$$

2. Edna took her little sister to a play circus. She had to pay 7 pins to get in and 5 pins for her little sister. How many pins did she give for both?

$$7 \text{ pins} + 5 \text{ pins} = ? \text{ pins.}$$

3. Helen's mother gave her 9 valentine postals and she bought 4 more. To how many friends could she send postals?

$$9 \text{ postals} + 4 \text{ postals} = ? \text{ postals.}$$

4. Sam's father has 7 white pigs and 5 black ones. How many pigs has he?

$$7 \text{ pigs} + 5 \text{ pigs} = ? \text{ pigs.}$$

5. If 4 children in a park meet nine other children, how many children meet together?



The figure 0 (zero) stands for *none*. Adding zero to a number does not make it any larger¹; for example— $5+0=5$; $0+7=7$; $1+0=1$; $0+3=3$; etc.

Give the following sums, which include the zero combinations:

4	0	6	0	0	4	1	0	5	0	3	4
8	4	5	0	2	7	0	9	7	6	8	0
3	3	6	5	0	7	9	9	0	2	5	0
6	0	7	0	3	8	0	2	7	0	8	8

GAMES FOR DRILL

1. The Ten Family

Have the pupil count out 10 pegs and arrange them into two groups making 10. Count out 10 more pegs and arrange them into two different groups making 10. Make as many different groups as possible. Use other numbers in the same way.

5 + 5	6 + 4	9 + 1			
7 + 3	8 + 2				

2. I Am Thinking

Teacher: I am thinking of two numbers which make 11.

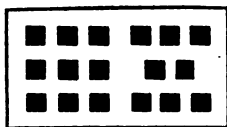
Pupil: Are they 8 and 3? Teacher: No.

Pupil: Are they 7 and 4? Teacher: Yes, I am thinking that 7 and 4 make 11.

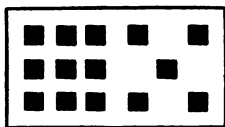
Then the pupil whose answer is accepted may be leader and suggest the next number to be used and so on.

¹Also show at this point or in connection with subtraction that subtracting 0 from any number does not make it any smaller. $5 - 0 = 5$.

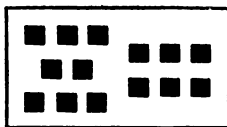
ADDITION COMBINATIONS



$$9 + 8 = ?$$



$$9 + 5 = ?$$



$$8 + 6 = ?$$

1. Roger had 9 marbles and bought 5 more. How many did he then have?

$$9 \text{ marbles} + 5 \text{ marbles} = ? \text{ marbles.}$$

2. Ethel had 9 clothespins and her mother handed her 8 more to hang her doll clothes on the line. How many clothespins did she then have?

$$9 \text{ clothespins} + 8 \text{ clothespins} = ? \text{ clothespins.}$$

3. Martha cut a large pie into 8 pieces and a small pie into 6 pieces. How many pieces did she have to serve to her friends at her party?

$$8 \text{ pieces} + 6 \text{ pieces} = ? \text{ pieces.}$$

4. On her way to school Clara saw 9 robins and 8 bluejays. How many birds did she see altogether?

$$9 \text{ birds} + 8 \text{ birds} = ? \text{ birds.}$$

5. Roy put 5 pennies in his bank on Friday and 9 more on Saturday. How many pennies did he put in the bank on both days?

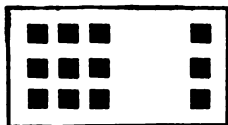
$$5 \text{ pennies} + 9 \text{ pennies} = ? \text{ pennies.}$$

6. Alice painted 6 Easter cards and Ruth painted 8. How many did they both paint?

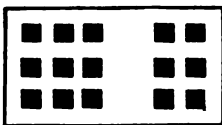
$$6 \text{ cards} + 8 \text{ cards} = ? \text{ cards.}$$

7. Which makes more, 9 and 4 or 8 and 6?

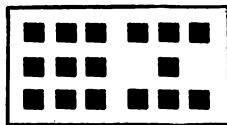
8. Which makes more, 7 and 5 or 8 and 3?



$$9 + 3 = ?$$



$$9 + 6 = ?$$



$$9 + 7 = ?$$

1. Eva cut out 9 pictures for her scrapbook. Edna cut out 7 more to help her. How many did they cut out together?

$$9 \text{ pictures} + 7 \text{ pictures} = ? \text{ pictures.}$$

2. You know that 10 and 6 = 16. Will $9+6$ be more or less than $10+6$? $9+6=?$

3. Helen has two dolls. She has 6 dresses for one doll and 9 for the other. Her Aunt Mary asked her how many dresses she had for both dolls?

$$6 \text{ dresses} + 9 \text{ dresses} = ? \text{ dresses.}$$

4. During one week Arthur got 3 E's on his written papers. During the next week he got 9 E's. How many E's did he get during both weeks?

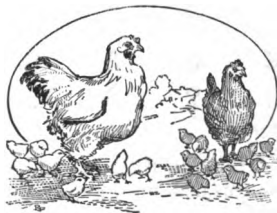
$$3 \text{ E's} + 9 \text{ E's} = ? \text{ E's.}$$

5. A department store has 9 women clerks and 3 men clerks in one department. How many clerks are there in that department?

$$9 \text{ clerks} + 3 \text{ clerks} = ? \text{ clerks.}$$

6. John has two hens. One hen has 7 chickens and the other has 9. How many chickens have both hens?

$$7 \text{ chickens} + 9 \text{ chickens} = ? \text{ chickens.}$$



SECOND YEAR

DRILL C

3	3	7	6	2	5	3	4	5	9
<u>6</u>	<u>9</u>	<u>8</u>	<u>7</u>	<u>9</u>	<u>9</u>	<u>8</u>	<u>9</u>	<u>7</u>	<u>7</u>
6	5	6	6	4	7	8	8	7	7
<u>9</u>	<u>8</u>	<u>8</u>	<u>3</u>	<u>7</u>	<u>6</u>	<u>9</u>	<u>5</u>	<u>9</u>	<u>5</u>
9	8	7	9	9	8	9	8	9	9
<u>2</u>	<u>6</u>	<u>4</u>	<u>8</u>	<u>5</u>	<u>3</u>	<u>4</u>	<u>7</u>	<u>3</u>	<u>6</u>

"TWO DEEP"—A NUMBER GAME

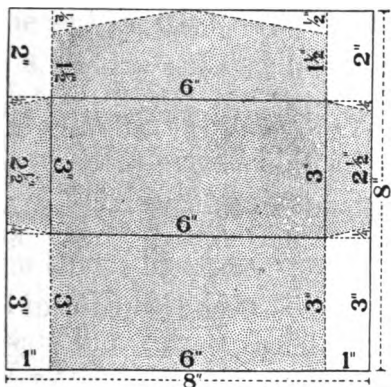
Have the class stand in two lines, each pupil in the back line standing back of a pupil in the front line. Flash a card, containing an addition combination, in front of one pair of pupils. The one who gives the sum first gets the card. Continue in this way several times around the class. The one having the most cards at the end of the game is the winner.

DRILL D*

9	0	5	7	0	7	0	8	9	0
<u>0</u>	<u>5</u>	<u>7</u>	<u>0</u>	<u>3</u>	<u>2</u>	<u>6</u>	<u>0</u>	<u>3</u>	<u>1</u>
0	4	9	8	0	2	8	5	9	0
<u>0</u>	<u>0</u>	<u>2</u>	<u>7</u>	<u>9</u>	<u>0</u>	<u>5</u>	<u>0</u>	<u>9</u>	<u>4</u>
6	6	3	6	0	4	0	1	3	0
<u>0</u>	<u>2</u>	<u>0</u>	<u>9</u>	<u>7</u>	<u>7</u>	<u>8</u>	<u>0</u>	<u>6</u>	<u>2</u>

*This drill features the zero combinations taught on page 43. Practice on this drill until pupils can give the sums as rapidly as those in drill A, B, or C.

We can play going shopping and buy things in a store. But first we must make a purse to hold our money.



Give each child an 8-inch square of paper. If possible, have it in alligator skin finish. First have the four long lines drawn and then have the corners cut out. The flaps need not necessarily be trimmed at the corners as shown in the drawing. Turn the flaps in and fasten to the front with brads. If no toy money is available, the children can make some by tracing around real coins and writing the proper denominations on the circles.

We are going to play store and buy and sell *picture toys*. Cut out pictures of all kinds of toys, such as dolls, doll beds, doll carriages, drums, engines, boats, etc. Put prices on these picture toys varying from 1 cent to 9 cents.

Find the cost of the following picture toys:

1. A doll (5 cents) and a doll bed (6 cents).
2. An engine (9 cents) and a drum (7 cents).
3. A boat (4 cents) and a wheelbarrow (8 cents).
4. A valentine (8 cents) and a balloon (5 cents).
5. A dog (3 cents) and an elephant (7 cents).

Have the pupils add to this list, always buying two toys at a time to give drill in the addition combinations.

A large envelope made from a sheet of paper 9" by 12" on a similar plan to that shown above may be used for a "store" in which to keep the toys. Boxes may also be used for stores.

SUBTRACTION FACTS III

Give the remainders in these subtraction facts by thinking: "What number added to the lower number makes the upper number?"

Subtract:

9	12	15	13	11	14	11	13	12	16	9
<u>6</u>	<u>9</u>	<u>8</u>	<u>7</u>	<u>9</u>	<u>9</u>	<u>8</u>	<u>9</u>	<u>7</u>	<u>7</u>	<u>0</u>

9	13	14	7	11	13	17	13	16	12	15
<u>3</u>	<u>8</u>	<u>8</u>	<u>0</u>	<u>7</u>	<u>6</u>	<u>9</u>	<u>5</u>	<u>9</u>	<u>5</u>	<u>9</u>

5	14	11	17	14	11	13	15	12	15	11
<u>0</u>	<u>6</u>	<u>4</u>	<u>8</u>	<u>5</u>	<u>3</u>	<u>4</u>	<u>7</u>	<u>3</u>	<u>6</u>	<u>2</u>

SUBTRACTION PROBLEMS

1. There are 12 months in a year. When children go to school 9 months each year, how many months do they have for vacation?

$$12 \text{ months} - 9 \text{ months} = ? \text{ months.}$$

2. A newsboy had 14 papers and sold 5. How many had he left? $14 - 5 = ?$

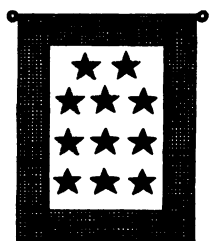
3. The U. S. flag has 13 stripes. 6 of them are white. How many of them are red? $13 - 6 = ?$

4. Of 15 gas jets in a dwelling, 6 had mantles. How many were without mantles? $15 - 6 = ?$

5. Ruth had 13 cents and spent 5 cents for an orange. How many cents had she left? $13 - 5 = ?$

6. Johnnie Careless gathered 12 eggs in the poultry house. On the way to the house, he fell and broke 5 of them. How many were unbroken? $12 - 5 = ?$

7. A store had a service flag with 11 stars on it. 2 of the stars were gold. How many blue stars were on the service flag? $11 - 2 = ?$



8. Edna's father bought 11 tons of coal during the winter, but used only 9 tons. How many tons did he have left for next winter? $11 - 9 = ?$

9. Harriet had 14 pennies and spent 8 of them for candy Easter eggs. How many pennies had she left? $14 - 8 = ?$

10. Robert is 9 years old and his brother is 17 years old. Find the difference between their ages. $17 - 9 = ?$

11. Ella had 15 cents and spent 9 cents for postal cards and stamps. How many cents had she left? $15 - 9 = ?$

REVIEW

Give the missing numbers in these subtraction problems

9	12	13	?	9	11	16	?	12	14
6	?	?	3	?	8	?	6	?	6
$\overline{?}$	$\overline{5}$	$\overline{9}$	$\overline{8}$	$\overline{6}$	$\overline{?}$	$\overline{9}$	$\overline{8}$	$\overline{3}$	$\overline{?}$

15	?	15	?	13	?	12	15	?	13
8	9	?	6	8	9	3	?	5	?
$\overline{?}$	$\overline{2}$	$\overline{6}$	$\overline{7}$	$\overline{?}$	$\overline{7}$	$\overline{?}$	$\overline{6}$	$\overline{7}$	$\overline{4}$

12	9	?	11	17	?	14	8	?	11
?	4	3	?	8	4	?	5	9	?
$\overline{8}$	$\overline{?}$	$\overline{7}$	$\overline{6}$	$\overline{?}$	$\overline{8}$	$\overline{7}$	$\overline{?}$	$\overline{9}$	$\overline{.4}$

SUBTRACTION DRILLS—DRILL A

<u>4</u>	<u>9</u>	<u>2</u>	<u>12</u>	<u>5</u>	<u>4</u>	<u>6</u>	<u>4</u>	<u>9</u>	<u>3</u>	<u>2</u>	<u>4</u>
<u>2</u>	<u>8</u>	<u>2</u>	<u>6</u>	<u>1</u>	<u>4</u>	<u>0</u>	<u>3</u>	<u>0</u>	<u>3</u>	<u>1</u>	<u>0</u>
<u>8</u>	<u>8</u>	<u>7</u>	<u>4</u>	<u>5</u>	<u>0</u>	<u>7</u>	<u>8</u>	<u>10</u>	<u>2</u>	<u>9</u>	<u>5</u>
<u>8</u>	<u>4</u>	<u>0</u>	<u>1</u>	<u>5</u>	<u>0</u>	<u>4</u>	<u>0</u>	<u>5</u>	<u>0</u>	<u>9</u>	<u>4</u>
<u>8</u>	<u>1</u>	<u>6</u>	<u>1</u>	<u>6</u>	<u>5</u>	<u>3</u>	<u>7</u>	<u>3</u>	<u>3</u>	<u>7</u>	
<u>7</u>	<u>1</u>	<u>3</u>	<u>0</u>	<u>6</u>	<u>0</u>	<u>1</u>	<u>7</u>	<u>0</u>	<u>1</u>	<u>6</u>	

DRILL B

<u>5</u>	<u>11</u>	<u>10</u>	<u>11</u>	<u>6</u>	<u>18</u>	<u>8</u>	<u>10</u>	<u>6</u>	<u>14</u>	<u>6</u>
<u>3</u>	<u>7</u>	<u>8</u>	<u>6</u>	<u>1</u>	<u>9</u>	<u>6</u>	<u>2</u>	<u>5</u>	<u>7</u>	<u>4</u>
<u>9</u>	<u>8</u>	<u>8</u>	<u>9</u>	<u>9</u>	<u>10</u>	<u>6</u>	<u>9</u>	<u>8</u>	<u>10</u>	<u>10</u>
<u>4</u>	<u>1</u>	<u>5</u>	<u>1</u>	<u>2</u>	<u>9</u>	<u>2</u>	<u>7</u>	<u>2</u>	<u>1</u>	<u>4</u>
<u>7</u>	<u>16</u>	<u>7</u>	<u>11</u>	<u>10</u>	<u>7</u>	<u>5</u>	<u>9</u>	<u>10</u>	<u>7</u>	<u>12</u>
<u>3</u>	<u>8</u>	<u>2</u>	<u>5</u>	<u>7</u>	<u>1</u>	<u>2</u>	<u>5</u>	<u>3</u>	<u>5</u>	<u>8</u>

DRILL C

<u>10</u>	<u>14</u>	<u>11</u>	<u>17</u>	<u>9</u>	<u>13</u>	<u>8</u>	<u>15</u>	<u>9</u>	<u>16</u>	<u>11</u>
<u>6</u>	<u>6</u>	<u>4</u>	<u>9</u>	<u>3</u>	<u>4</u>	<u>3</u>	<u>9</u>	<u>6</u>	<u>7</u>	<u>9</u>
<u>14</u>	<u>12</u>	<u>15</u>	<u>12</u>	<u>16</u>	<u>12</u>	<u>13</u>	<u>11</u>	<u>13</u>	<u>13</u>	<u>12</u>
<u>9</u>	<u>5</u>	<u>7</u>	<u>9</u>	<u>9</u>	<u>7</u>	<u>8</u>	<u>3</u>	<u>6</u>	<u>9</u>	<u>4</u>
<u>13</u>	<u>11</u>	<u>13</u>	<u>12</u>	<u>15</u>	<u>11</u>	<u>15</u>	<u>14</u>	<u>14</u>	<u>17</u>	
<u>5</u>	<u>2</u>	<u>7</u>	<u>3</u>	<u>6</u>	<u>8</u>	<u>8</u>	<u>8</u>	<u>5</u>	<u>8</u>	

The above drills include all of the 100 subtraction facts. Practice on Drills B and C until pupils can give them as rapidly as they can Drill A.

Add:

2	8	5	6	3	4	7
<u>2</u>	<u>8</u>	<u>5</u>	<u>6</u>	<u>3</u>	<u>4</u>	<u>7</u>

1. How many 2's are there in the first column?
Two 2's are how many?

Two 8's = ?	Two 6's = ?	Two 4's = ?
Two 5's = ?	Two 3's = ?	Two 7's = ?

2. We may also write these facts in this way:

$2 \times 8 = ?$	$2 \times 6 = ?$	$2 \times 4 = ?$
$2 \times 5 = ?$	$2 \times 3 = ?$	$2 \times 7 = ?$

The sign $\times$ means to multiply and is read *times*. 2×8 is read 2 times 8 = 16. If 8 is written down two times and added, the sum is 16. In multiplying we try to remember the answers (or products) instead of always writing the number down a certain number of times and then adding. *Multiplying* is therefore only a *short way of adding*.

3. Harold picked 5 quarts of strawberries and Ben picked 2 times as many. How many quarts did Ben pick?

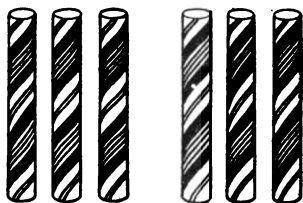
$$2 \times 5 \text{ quarts} = ? \text{ quarts.}$$

4. Margaret sharpened 9 pencils and John sharpened 2 times as many. How many pencils did John sharpen?

$$2 \times 9 \text{ pencils} = ? \text{ pencils.}$$

5.	$6 + 6 = ?$	Two 6's = ?	$2 \times 6 = ?$
6.	$9 + 9 = ?$	Two 9's = ?	$2 \times 9 = ?$
7.	$7 + 7 = ?$	Two 7's = ?	$2 \times 7 = ?$
8.	$10 + 10 = ?$	Two 10's = ?	$2 \times 10 = ?$
9.	$8 + 8 = ?$	Two 8's = ?	$2 \times 8 = ?$
10.	$5 + 5 = ?$	Two 5's = ?	$2 \times 5 = ?$

ONE-HALF



If we divide a thing or a group of things into two equal parts, each of the parts is called *one-half*.

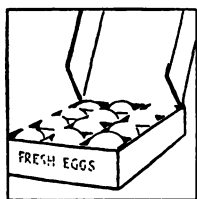
One-half is also written $\frac{1}{2}$.

1. What is $\frac{1}{2}$ of the 6 sticks of candy shown in the illustration at the top of the page?

2. John's father gave 10 pennies to his sister. She divided them into two equal parts and gave John $\frac{1}{2}$ of them. How many pennies did she give John?

3. There are 16 ounces in a pound. Elizabeth bought $\frac{1}{2}$ of a pound of candy. How many ounces did she buy?

4. Mary's mother had 8 bananas in the ice box. She told Mary that she might have $\frac{1}{2}$ of them for a picnic lunch. How many bananas should Mary take?



5. Harry's mother ordered a dozen eggs from the grocery store. By mistake they only sent her $\frac{1}{2}$ of a dozen. There are 12 in a dozen. How many eggs did they send her?

6. Harold found 14 eggs in a hen's nest in the barn. Only $\frac{1}{2}$ of the eggs were good. How many eggs were good?

$$\frac{1}{2} \text{ of } 4 = ?$$

$$\frac{1}{2} \text{ of } 2 = ?$$

$$\frac{1}{2} \text{ of } 18 = ?$$

$$\frac{1}{2} \text{ of } 8 = ?$$

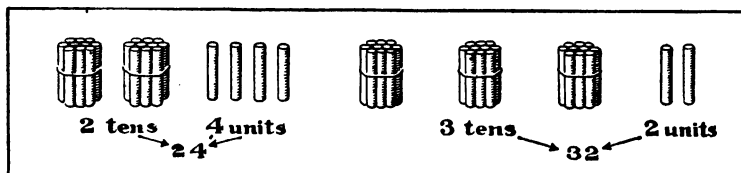
$$\frac{1}{2} \text{ of } 16 = ?$$

$$\frac{1}{2} \text{ of } 12 = ?$$

$$\frac{1}{2} \text{ of } 14 = ?$$

$$\frac{1}{2} \text{ of } 6 = ?$$

$$\frac{1}{2} \text{ of } 10 = ?$$



A thorough review of the addition combinations on pages 16 to 47 should be given at the beginning of the third year before the new work for this grade is begun.

1. The number 14 stands for how many tens and how many units? What part of the word fourteen stands for ten? (See page 6.)

2. Count by 10's to 60. What part of the word *sixty* stands for ten? How many tens are there in 60?

3. How many tens and how many units are there in 24? In 32?

In numbers of two figures, the first figure at the right-hand side of the number stands for *units* and the second figure from the right stands for *tens*.

4. Tell the number of tens and units in each of these numbers:

49 65 27 83 58 37 25 96

5. How many tens and how many units are there in 40?

If we say there are 4 tens in forty, we must then place a figure after the 4 which shows that there are *no* units. We call this figure *zero* or *naught*. If the zero were not placed after the 4, the number would read 4 and not 40. The *zero*, then, is a figure which is used to fill in vacant places in writing numbers.

425 is read *four hundred twenty-five*. The 4 in the third place stands for *hundreds*.

READING AND WRITING NUMBERS

6. Give the number of hundreds, tens, and units in the following numbers:

793	146	625	274	927.	836
347	372	824	768	539	149

7. 600 is read *six hundred*. How many units are there in units' place in this number? How many tens? How many hundreds?

Since there are *no* tens and *no* units, we must place two zeros after the 6 to fill in the vacant places so that the 6 will be in the *third* place from the right or *hundreds'* place.

8. 507 is read *five hundred seven*. In this number the zero is used to fill in what vacant place? If we did not have the zero between the 5 and the 7, how would the number be read?

9. Write these numbers in figures:

Nine hundreds, no tens, no units.

Seven hundreds, three tens, seven units.

Three hundreds, eight tens, no units.

Eight tens, five units.

10. Read the following numbers:

603	590	800	950	95	503
700	308	705	301	463	720

11. The number 4,825 is read *four thousand eight hundred twenty-five*. The 4 in the fourth place from the right stands for *thousands*.

12. Read these numbers:

8,675	3,207	7,862	8,050	3,226
9,000	4,500	9,426	7,821	5,705

Drills E to J should be used for speed exercises as well as a review of the addition combinations. The following time limits should be reached before the *end* of the third grade work: *Excellent* 35 seconds; *Good* 45 seconds; *Fair* 55 seconds.

DRILL E

3	4	3	1	3	9	7	6	7	2	1
6	6	9	1	3	0	8	7	3	9	6
8	5	3	0	6	4	2	7	5	9	4
8	9	8	5	2	9	2	7	7	7	2
6	4	9	5	6	8	6	1	7	6	7
9	4	9	8	3	2	8	2	0	6	4

DRILL F

7	6	0	8	7	4	8	7	4	7	5
6	2	3	9	1	8	5	9	2	5	5
3	9	8	6	7	4	3	9	9	0	2
3	2	6	5	4	1	7	8	5	6	5
8	1	5	9	8	6	8	9	2	9	9
3	9	3	4	7	4	0	3	1	9	6

DRILL G

0	3	5	3	1	7	7	6	2	5	5
1	6	6	9	7	2	8	7	8	9	4
6	2	3	4	3	4	5	8	5	9	2
6	9	8	0	5	9	1	4	7	7	7
6	2	2	5	6	7	6	3	8	0	4
9	3	5	8	3	7	8	1	8	9	7

THIRD YEAR

DRILL H

7	2	4	8	5	3	8	7	7	7	2
6	0	6	9	5	3	5	9	3	5	2
8	9	8	6	7	1	7	5	9	9	4
8	2	6	2	4	1	7	0	8	5	2
8	6	9	9	8	0	8	9	1	6	9
3	1	9	4	7	4	2	3	5	6	6

DRILL I

6	3	2	7	4	4	3	6	2	2	2
0	9	6	8	3	8	6	7	4	9	3
6	5	3	3	4	1	3	5	3	9	2
5	9	8	3	9	8	7	7	0	7	5
6	1	5	5	6	6	6	4	9	4	0
9	4	3	8	3	4	8	4	9	7	7

DRILL J

7	5	8	0	1	7	8	7	2	7	8
6	6	9	8	3	2	5	9	8	5	1
1	6	9	8	3	7	3	8	9	9	2
0	6	2	6	5	4	4	4	8	5	7
8	9	5	9	8	7	9	4	0	8	9
3	1	2	4	7	7	3	5	2	8	6

Drills E to J include the difficult combinations more frequently than the easy combinations. Emphasis is thus placed where it is needed most—upon the difficult combinations. The zero combinations are also distributed through these drills.

ADDITION BY ENDINGS I

Give the following sums rapidly:

<u>5</u>	<u>1</u>	<u>2</u>	<u>8</u>	<u>6</u>	<u>3</u>	<u>1</u>	<u>3</u>	<u>9</u>	<u>3</u>
<u>35</u>	<u>17</u>	<u>15</u>	<u>21</u>	<u>22</u>	<u>45</u>	<u>86</u>	<u>64</u>	<u>51</u>	<u>75</u>
<u>7</u>	<u>4</u>	<u>1</u>	<u>2</u>	<u>2</u>	<u>4</u>	<u>4</u>	<u>3</u>	<u>1</u>	<u>4</u>
<u>43</u>	<u>23</u>	<u>41</u>	<u>43</u>	<u>67</u>	<u>51</u>	<u>62</u>	<u>62</u>	<u>52</u>	<u>25</u>
<u>3</u>	<u>2</u>	<u>8</u>	<u>6</u>	<u>1</u>	<u>4</u>	<u>5</u>	<u>7</u>	<u>5</u>	<u>4</u>
<u>26</u>	<u>32</u>	<u>92</u>	<u>34</u>	<u>65</u>	<u>66</u>	<u>65</u>	<u>41</u>	<u>32</u>	<u>82</u>
<u>4</u>	<u>3</u>	<u>6</u>	<u>4</u>	<u>5</u>	<u>5</u>	<u>1</u>	<u>2</u>	<u>1</u>	<u>3</u>
<u>74</u>	<u>83</u>	<u>41</u>	<u>63</u>	<u>73</u>	<u>54</u>	<u>28</u>	<u>56</u>	<u>61</u>	<u>82</u>
<u>7</u>	<u>6</u>	<u>1</u>	<u>3</u>	<u>2</u>	<u>5</u>	<u>6</u>	<u>4</u>	<u>1</u>	<u>2</u>
<u>52</u>	<u>13</u>	<u>19</u>	<u>97</u>	<u>52</u>	<u>14</u>	<u>83</u>	<u>34</u>	<u>44</u>	<u>74</u>
<u>5</u>	<u>6</u>	<u>3</u>	<u>8</u>	<u>2</u>	<u>2</u>	<u>4</u>	<u>3</u>	<u>7</u>	<u>5</u>
<u>31</u>	<u>74</u>	<u>16</u>	<u>42</u>	<u>32</u>	<u>38</u>	<u>14</u>	<u>13</u>	<u>92</u>	<u>83</u>

To the teacher: Show that **3** added to any number ending in **4** gives a sum ending in **7**, the number of tens remaining the same. In the same way show that **5** added to a number ending in **3** gives an **8** ending, etc. Note that **6** added to a number ending in **4** gives a **0** ending, the sum having the next higher number of tens. This is also true of **5** and **5**; **3** and **7**; **2** and **8**; **1** and **9**.

6 added to any number ending in **8** gives a **4** ending. For example:

<u>6</u>	<u>6</u>	<u>6</u>	<u>6</u>	<u>6</u>	<u>6</u>	<u>6</u>	<u>6</u>	<u>6</u>
<u>48</u>	<u>28</u>	<u>58</u>	<u>18</u>	<u>98</u>	<u>78</u>	<u>38</u>	<u>68</u>	<u>88</u>
<u>54</u>	<u>34</u>	<u>64</u>	<u>24</u>	<u>104</u>	<u>84</u>	<u>44</u>	<u>74</u>	<u>94</u>

Write across the blackboard the numbers as follows:

46	26	56	16	96	76	36	66	86
----	----	----	----	----	----	----	----	----

Have the pupils add **2, 3, 4, 5, 6, 7, 8, or 9** in succession to each of these numbers. Change all of the unit figures to **7, 8, 9, 5, 4, 3, or 2** and add one of the numbers from **2** to **9** to each of the new series.

Use Drills I to III from right to left and from top to bottom to give a variety in the order of the arrangement of the combinations.

ADDITION BY ENDINGS II

<u>8</u>	<u>8</u>	<u>8</u>	<u>6</u>	<u>6</u>	<u>6</u>	<u>7</u>	<u>7</u>	<u>7</u>
<u>48</u>	<u>98</u>	<u>68</u>	<u>26</u>	<u>76</u>	<u>16</u>	<u>38</u>	<u>88</u>	<u>58</u>
<u>5</u>	<u>5</u>	<u>5</u>	<u>4</u>	<u>4</u>	<u>4</u>	<u>6</u>	<u>6</u>	<u>6</u>
<u>26</u>	<u>86</u>	<u>76</u>	<u>37</u>	<u>77</u>	<u>57</u>	<u>47</u>	<u>97</u>	<u>17</u>
<u>2</u>	<u>2</u>	<u>2</u>	<u>5</u>	<u>5</u>	<u>5</u>	<u>5</u>	<u>5</u>	<u>5</u>
<u>19</u>	<u>69</u>	<u>89</u>	<u>48</u>	<u>78</u>	<u>38</u>	<u>27</u>	<u>97</u>	<u>77</u>
<u>4</u>	<u>4</u>	<u>4</u>	<u>3</u>	<u>3</u>	<u>3</u>	<u>9</u>	<u>9</u>	<u>9</u>
<u>49</u>	<u>19</u>	<u>69</u>	<u>28</u>	<u>78</u>	<u>38</u>	<u>68</u>	<u>48</u>	<u>18</u>
<u>5</u>	<u>5</u>	<u>5</u>	<u>6</u>	<u>6</u>	<u>6</u>	<u>3</u>	<u>3</u>	<u>3</u>
<u>29</u>	<u>69</u>	<u>39</u>	<u>58</u>	<u>78</u>	<u>48</u>	<u>89</u>	<u>99</u>	<u>19</u>
<u>6</u>	<u>6</u>	<u>6</u>	<u>7</u>	<u>7</u>	<u>7</u>	<u>7</u>	<u>7</u>	<u>7</u>
<u>79</u>	<u>29</u>	<u>59</u>	<u>17</u>	<u>47</u>	<u>87</u>	<u>39</u>	<u>99</u>	<u>29</u>

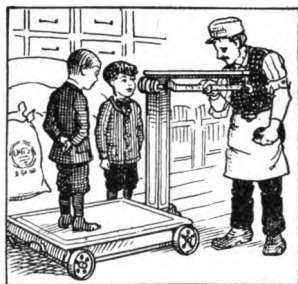
REVIEW PROBLEMS

1. John's father had a grove of hickory trees. He gave John all the nuts to sell toward buying a bicycle. John gathered 28 quarts of small nuts and 8 quarts of large ones. How many quarts did he have altogether?

2. Grace had 78 cents in her bank and her father gave her 7 cents more. How many cents did she then have?

3. Helen's mother gave her some money to buy groceries and told her that she might have the change to buy candy. The groceries cost 54 cents and she had 6 cents left. How much money did she have at first?

4. Henry and Arthur were weighed on the scales at the feed store. The merchant told Henry that he weighed 68 pounds. He then weighed Arthur and said, "You weigh 5 pounds more than Henry." What was Arthur's weight?



5. Edward had \$27 in the savings bank. He put \$4 more in the bank. How much did he then have in the bank? (Show that the sign \$ is a short way of writing dollars.)

6. Paul's father caught 16 fish and Paul caught 6 more than his father. How many did Paul catch?

7. Marion's aunt sent her 27 postals of views in Yellowstone Park and 6 postals of views in Portland. How many postals of both kinds were there?

8. Ethel bought a coat and a hat at a department store. The coat cost \$17 and the hat cost \$5. How much did Ethel pay for both?

9. Fred took care of his mother's chickens. They had 68 young chicks. Another hen hatched out 9 more. How many young chicks did Fred then have to care for?

10. Martha and her sister measured how tall they were by standing with their backs against a wall. They found Martha's height to be 49 inches. Her sister's mark was 4 inches above Martha's. How tall was her sister?

11. A class of 29 pupils and 2 teachers went on a picnic. They had to plan the lunch for how many people?

ADDING BY ENDINGS

12. Joe told his teacher that he caught 27 fish during a fishing trip and that his father caught 7 more than he did. How many fish did his father catch?

13. Roy's family used 18 quarts of milk last week. They used 3 quarts more this week. How many quarts did they use this week?

14. Mildred counted the money in her bank. She had 89 cents. Her father told her that he would give her 5 cents more if she would tell him how many cents she would then have. What should she have answered?

15. Donald had 48 marbles and traded an old pocket knife for 6 more. How many did he then have?

16. George took a load of watermelons to the city to sell. He sold 3 on the road and 19 in the city. How many did he sell altogether?

17. Carl had 39 cents. He asked his father for 6 cents more so that he would have money enough to buy a pocket knife which he saw in a store. What was the price of the knife?

18. Doris and Dorothy were reading fairy stories. Doris said she was reading on page 59 in her book. Dorothy said, "I have read 7 pages more than you have." How many pages had Dorothy read?

As the pupils work these problems the teacher may write the problems on the blackboard in short form as: $27 \text{ fish} + 7 \text{ fish} = ? \text{ fish}$. After all of the problems have been solved in this way, these short statements may be used for drill purposes in adding by endings.

ADDING BY ENDINGS III

9	9	9	4	4	4	7	7	7
<u>19</u>	<u>79</u>	<u>49</u>	<u>28</u>	<u>88</u>	<u>58</u>	<u>46</u>	<u>26</u>	<u>36</u>

8	8	8	7	7	7	9	9	9
<u>97</u>	<u>57</u>	<u>17</u>	<u>64</u>	<u>24</u>	<u>44</u>	<u>72</u>	<u>32</u>	<u>42</u>

8	8	8	7	7	7	9	9	9
<u>35</u>	<u>75</u>	<u>25</u>	<u>15</u>	<u>35</u>	<u>95</u>	<u>64</u>	<u>44</u>	<u>84</u>

9	9	9	8	8	8	8	8	8
<u>55</u>	<u>35</u>	<u>85</u>	<u>79</u>	<u>49</u>	<u>29</u>	<u>13</u>	<u>93</u>	<u>23</u>

8	8	8	6	6	6	8	8	8
<u>16</u>	<u>46</u>	<u>76</u>	<u>25</u>	<u>95</u>	<u>35</u>	<u>64</u>	<u>54</u>	<u>84</u>

9	9	9	9	9	9	9	9	9
<u>93</u>	<u>13</u>	<u>43</u>	<u>56</u>	<u>26</u>	<u>86</u>	<u>67</u>	<u>37</u>	<u>77</u>

REVIEW PROBLEMS

1. A newsboy sold 28 papers to passengers on a train and 4 to people at the depots along the route. How many papers did he sell on that trip?



2. Bertha had 79 tulip bulbs and bought 9 more. How many did she then have to plant in her tulip bed?

3. Elizabeth had 27 cents in her purse and her mother gave her 8 more. How much did she then have?

REVIEW PROBLEMS

4. The third-grade class sold tickets to their entertainment. The pupils sold 86 tickets and the teacher sold 7. How many did they sell altogether?

5. Edward kept a record of the eggs which he got from his flock of hens. They laid 47 eggs during the first 6 days and 8 eggs on the seventh day of one week. How many eggs did he get that week?

6. There were 44 passengers on a street car when it stopped at Main Street. 7 more got on the car and no one got off. How many were then on the car?

7. On a holiday Albert and his father drove their car 9 miles in the morning and 32 miles in the afternoon. How many miles did they drive that day?

8. Ella gathered 15 roses and 8 peonies for a bouquet for the schoolroom. How many flowers did she have in the bouquet?

9. There were 25 erasers at the blackboard and the teacher put 7 new ones with them. How many erasers were there at the board then?

10. Edwin bought 24 cents worth of soap and 9 cents worth of salt for his mother. What did he have to pay for both?

11. Olive sold flower seeds for her mother. She sold 19 packages one day and 8 the next. How many did she sell on both days?

12. Elmer sold 33 papers in the morning and 8 in the afternoon. How many did he sell during the day?

13. Floyd bought a baseball glove for 75 cents and had 9 cents left with which to buy marbles. How much money did he have to spend on that shopping trip?

14. Frank asked his mother how tall she was. She said she was 64 inches tall. He asked his father how tall he was. His father replied, "I am 8 inches taller than your mother." Frank knew that his father was how many inches tall?

15. Gladys and Edith timed each other on a drill exercise. It took Edith 33 seconds, but it took Gladys 9 seconds longer than Edith's record. In how many seconds did Gladys do the exercise?

16. Mary's mother gave her 46 cents which she had in her purse and 9 cents from the sideboard and told her to buy meat for dinner. How much did she have to spend for meat?

17. Nellie had 77 cents in her home savings bank. Her father gave her 9 cents more for running an errand. How many cents did she have in her bank after she put the 9 cents in it?

18. Eva has 87 postals in her post card album. Her grandma has promised to send her 9 more for her birthday. How many will that make altogether?

19. William has 63 books in his bookcase and 9 more in a bookrack. How many books does he have in both?

20. Elizabeth picked 16 boxes of strawberries and 9 boxes of currants for her mother. How many boxes of fruit did she pick?

DRILL CARD FOR ADDING BY ENDINGS

8	3	7	5	2	9	6	1	4	0
---	---	---	---	---	---	---	---	---	---

Copy the numbers from 0 to 9, arranged as shown above, on a narrow strip of cardboard. Place this drill card on a sheet of paper and add one of the following numbers to each of the numbers on the drill card. Place the answers on the paper below the lower edge of the card. Cover up this row of answers with the drill card and use another number in the same way.

52	33	49	87	83	68	79	74
15	71	68	45	45	89	24	87
69	28	27	29	37	56	17	43
46	84	59	67	54	38	78	58
97	60	36	26	19	47	39	16

At the close of the drill the answers should be checked. The teacher may read the correct answers or have some pupil read his answers for the class, the teacher checking as the pupil reads.

COLUMN ADDITION I

Add the following problems from the bottom upward:

9	8	3	6	7	8	2	7	6	3
4	0	4	3	1	0	3	1	1	2
5	9	6	4	4	8	6	9	7	6
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>

9	9	7	4	5	7	8	6	5	5
0	2	3	2	3	0	2	2	1	0
3	4	3	5	5	7	7	3	8	9
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>

7	1	4	4	8	8	9	7	9	4
4	9	0	2	1	0	2	3	1	0
4	9	8	7	3	7	1	6	1	9
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>

COLUMN ADDITION II

7	9	8	7	8	6	8	5	8	5
2	5	0	1	2	4	3	2	3	0
2	1	9	6	6	2	7	8	5	8
—	—	—	—	—	—	—	—	—	—
8	8	4	9	1	5	3	6	9	9
5	3	4	0	8	6	6	0	1	4
2	3	5	9	8	1	3	7	7	1
—	—	—	—	—	—	—	—	—	—
5	9	3	7	7	6	8	8	7	3
0	4	4	8	3	0	1	2	1	0
7	3	4	2	2	9	3	1	1	7
—	—	—	—	—	—	—	—	—	—

COLUMN ADDITION III

6	5	3	6	9	8	6	2	6	6
1	8	1	0	2	5	0	6	5	0
5	1	9	5	2	5	9	4	3	5
—	—	—	—	—	—	—	—	—	—
9	9	6	7	5	4	7	3	2	8
2	2	0	4	2	0	3	0	7	0
3	5	8	2	6	7	6	9	2	7
—	—	—	—	—	—	—	—	—	—
6	1	8	9	5	7	1	9	7	9
5	6	0	4	2	0	7	3	0	3
4	6	3	6	8	4	7	3	3	4
—	—	—	—	—	—	—	—	—	—

Prove that in the magic square the figures in every row, if added, will equal fifteen. The rows may be added up and down, or right and left, or cornerwise.

Furnish each pupil with nine separate squares of cardboard. Have them numbered as indicated. Mix them up and then rearrange (without consulting the book) so that the sum of the columns each way will be 15.

2	9	4
7	5	3
6	1	8

The Magic Square

COLUMN ADDITION

Add these columns from the top down:

3	5	2	9	3	5	4	2	5	1	6
5	2	2	2	3	4	4	8	1	8	5
3	3	8	4	4	1	8	3	6	3	7
2	4	4	5	6	7	2	2	7	5	5
<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>

6	6	7	7	6	9	8	8	7	6	5
3	1	6	7	9	7	7	3	4	8	7
4	5	3	8	4	3	3	1	3	3	6
1	4	8	8	9	8	5	9	9	6	9
<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>

9	7	8	9	6	9	5	7	8	7	9
5	9	7	3	8	7	8	5	8	8	9
3	9	9	7	9	7	9	9	6	9	9
4	6	7	6	7	8	3	8	7	6	7
<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>

Add these columns from the bottom up:

1	4	2	4	4	7	2	6	3	4	3
7	0	7	3	6	5	3	4	6	5	8
5	5	2	2	2	3	4	7	7	2	2
7	9	4	9	8	2	3	4	6	9	6
4	3	5	6	6	8	9	9	9	7	7
<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>

3	5	6	4	3	6	6	4	5	8	4
8	7	9	9	9	7	5	9	8	6	8
2	9	8	7	7	2	6	5	4	5	6
9	6	1	5	6	8	5	6	8	3	4
8	7	5	8	9	8	8	8	3	9	9
<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>

Additional practice on this exercise may be obtained by having the pupils check their answers by adding from the top downward. This gives a different set of combinations from those encountered by adding from the bottom up.

Add the following columns upward:

1	5	5	1	2	1	4	8	9	7	8
7	0	3	7	6	7	3	3	7	4	3
4	2	3	8	8	9	9	8	2	8	6
7	6	1	9	3	7	8	9	7	5	5
9	8	8	8	4	8	9	6	8	9	7
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>

7	6	5	3	8	8	9	2	9	9	3
2	5	9	9	3	8	5	7	6	8	9
9	7	9	9	3	9	8	6	3	7	8
7	3	5	4	9	1	5	9	6	8	4
6	6	7	6	8	4	7	7	9	9	4
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>

ADDING BY GROUPS

Add as shown by combining the numbers in groups:

						4	9	6
3	9	3	1}	4}	5}	7}	2}	3}
4	5	6	9}	6}	5}	3}	3}	2}
5}	7}	8}	8	8	4}	8}	7}	1}
5}	3}	2}	7	6	6}	2}	3}	9}
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>

In the following, show, as above, the numbers you could group in adding. Then add, using these groups:

7	4	6	1	3	4	7	6	5	4	4
3	2	4	3	2	6	3	2	5	3	4
2	8	3	4	1	2	2	0	6	8	2
6	5	4	6	9	3	8	5	3	2	9
4	5	1	5	5	7	6	5	1	6	1
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>

Do not *force* a child to use any definite system of grouping in this grade. *Encourage* him to use an occasional easy group to shorten his work in adding a column.

ORAL PRACTICE TABLE FOR BLACKBOARD AND DESK

A	VI	VII	VIII	IX	X	D
V	2	7	8	4	3	
IV	8	3	6	2	9	
III	5	8	5	4	7	
II	2	7	4	9	6	
I	3	5	1	6	1	
C						B

1. Add the numbers in columns VI to X up. Prove the results by adding the same columns down.

2. Add the numbers in the rows I to V from left to right. Prove the results by adding from right to left.

3. When a class is able to add the numbers in the vertical and horizontal lines speedily and correctly, practice in like manner may be given on the numbers in the diagonal lines from A to B and from C to D. These diagonal lines should be traced with a pointer. This table presents the principal number combinations in addition and the arrangement provides for the easy addition of numbers by groups as illustrated on the preceding page.

Use the blackboard freely. A device such as this on the board furnishes a good beginning for recitations, as well as a means of using odd moments during the day, which otherwise might be wasted. The time of the drill should be shortened as the children become more proficient.

The same form with other arrangements of numbers may be used for additional oral or written drills.

Add 53 and 42.

53 In 53 there are 5 tens and 3 units. In 42 there are
 42 4 tens and 2 units. Beginning with the units' column,
 95 2 units and 3 units are 5 units. Write the 5 in units'
 place in the sum. 4 tens and 5 tens are 9 tens. Write
 the 9 in the tens' place in the sum. Then the sum of
 53 and 42 is 95.

Add:

<u>24</u>	<u>43</u>	<u>72</u>	<u>53</u>	<u>23</u>	<u>82</u>	<u>44</u>	<u>25</u>
<u>63</u>	<u>25</u>	<u>17</u>	<u>36</u>	<u>34</u>	<u>12</u>	<u>24</u>	<u>62</u>

<u>31</u>	<u>26</u>	<u>63</u>	<u>54</u>	<u>40</u>	<u>15</u>	<u>35</u>	<u>51</u>
<u>41</u>	<u>72</u>	<u>13</u>	<u>32</u>	<u>57</u>	<u>63</u>	<u>24</u>	<u>23</u>

<u>52</u>	<u>53</u>	<u>20</u>	<u>13</u>	<u>52</u>	<u>65</u>	<u>73</u>	<u>24</u>
<u>21</u>	<u>16</u>	<u>74</u>	<u>43</u>	<u>43</u>	<u>30</u>	<u>23</u>	<u>54</u>

<u>13</u>	<u>41</u>	<u>27</u>	<u>64</u>	<u>15</u>	<u>52</u>	<u>36</u>	<u>51</u>
<u>76</u>	<u>23</u>	<u>20</u>	<u>21</u>	<u>83</u>	<u>11</u>	<u>33</u>	<u>41</u>

<u>34</u>	<u>15</u>	<u>52</u>	<u>26</u>	<u>42</u>	<u>32</u>	<u>16</u>	<u>44</u>
<u>20</u>	<u>61</u>	<u>13</u>	<u>30</u>	<u>14</u>	<u>24</u>	<u>41</u>	<u>20</u>
<u>43</u>	<u>23</u>	<u>24</u>	<u>42</u>	<u>33</u>	<u>20</u>	<u>30</u>	<u>15</u>

<u>40</u>	<u>34</u>	<u>25</u>	<u>33</u>	<u>13</u>	<u>51</u>	<u>21</u>	<u>60</u>
<u>36</u>	<u>12</u>	<u>43</u>	<u>20</u>	<u>61</u>	<u>16</u>	<u>10</u>	<u>13</u>
<u>12</u>	<u>50</u>	<u>30</u>	<u>14</u>	<u>25</u>	<u>21</u>	<u>68</u>	<u>23</u>

This page of double column addition involves no "carrying." The purpose of this work is to accustom the pupils to the terms *tens* and *units*, and thus prepare the way for the problems which involve "carrying."

ORAL REVIEW PRACTICE IN ADDITION I

Give orally the sums of the following:

$2 + 7 + 1 + 6 =$

$5 + 4 + 7 + 1 =$

$7 + 7 + 1 + 5 =$

$8 + 4 + 2 + 4 =$

$4 + 2 + 6 + 9 =$

$6 + 5 + 7 + 2 =$

$9 + 5 + 3 + 6 =$

$9 + 9 + 5 + 8 =$

$3 + 9 + 3 + 4 =$

$5 + 3 + 6 + 7 =$

$6 + 9 + 7 + 5 =$

$4 + 9 + 3 + 9 =$

$9 + 7 + 3 + 8 =$

$9 + 3 + 5 + 3 =$

$8 + 8 + 2 + 6 =$

$7 + 8 + 9 + 7 =$

$9 + 8 + 5 + 9 =$

$5 + 8 + 8 + 8 =$

$9 + 4 + 6 + 9 =$

$6 + 7 + 5 + 7 =$

$6 + 5 + 5 + 6 =$

$9 + 7 + 9 + 8 =$

$8 + 3 + 3 + 9 =$

$5 + 7 + 1 + 9 =$

$9 + 2 + 1 + 7 =$

$8 + 6 + 8 + 8 =$

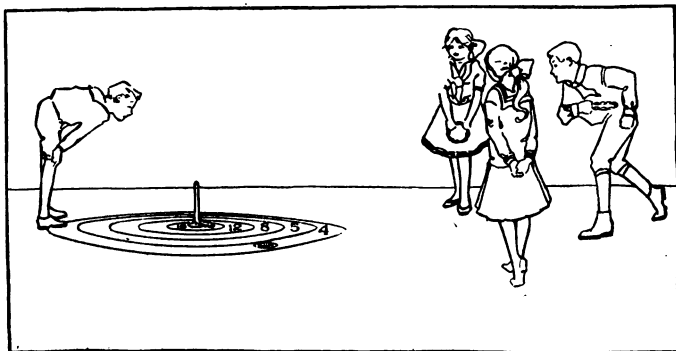
ORAL REVIEW II

1. Give groups of two numbers whose sums equal each of the following numbers: 7; 9; 11; 18; 17; 14; 13; 16; 12; 15; 10; 19; 8; 6.

2. How many different pairs of numbers can you find which added together make each of the following sums: 9; 11; 13; 16; 10; 8; 12; 14; 7?

3. Give three numbers whose sum is 13. Find groups of three numbers which equal the following sums: 10; 16; 20; 13; 19; 21; 17; 12.

4. Give different groups of 4 numbers for each of these sums: 20; 12; 18; 17; 24; 31; 19; 27; 14.



PLAYING RING-TOSS

These children are playing ring-toss. They are trying to throw rope rings over a post set upright in a board. "Ringing" the post counts 20 points. Circles are drawn with a string and piece of chalk around the spot where the post is placed. How much does tossing in each of these circles count? A rope ring lying on a line counts in the circle outside of that line.

If a ring-toss post and rope rings are not available, a large nail may be driven through a board for the post and old fruit jar rubbers may be used for the rings.

In this game each child had three throws. These are their scores. Whose score is the highest?

Richard	Gene	Edwin	Betty
16	12	8	5
20	4	12	5
4	4	0	20

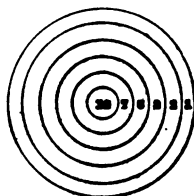
When the children try to find whose score is the highest, they will discover that they do not know how. Their desire to "know how" will make the teacher's explanation more impressive. Simply state that 10 units (or ones) = 1 ten and that 1 ten must be added to the other tens and a zero placed in units' place in the sum to show that there were no units left after making the 1 ten which has been added in with the other tens.

THE RING-TOSS GAME

Find these sums of the columns written like ring-toss scores:

1.	2.	3.	4.	5.	6.	7.	8.
12	16	25	27	34	17	12	33
3	20	3	13	6	2	35	3
24	51	50	30	20	51	23	24
<u>41</u>	<u>3</u>	<u>2</u>	<u>10</u>	<u>10</u>	<u>10</u>	<u>10</u>	<u>10</u>

Here is another numbering of the rings. Those who can, may make up some scores from this picture. Choose names for the children you pretend are playing, and find out who has the highest score. Have the sum in each units' column equal to 10.



If you would rather, you may add these ready-made scores, instead:

1.	2.	3.	4.	5.	6.	7.	8.
10	41	25	10	43	32	45	77
25	43	30	53	25	23	21	71
63	35	25	77	40	52	22	82
<u>42</u>	<u>41</u>	<u>60</u>	<u>20</u>	<u>12</u>	<u>73</u>	<u>52</u>	<u>10</u>

9.	10.	11.	12.	13.	14.	15.	16.
25	34	52	61	18	93	82	33
60	34	73	40	30	30	42	23
74	10	10	69	70	27	10	62
<u>51</u>	<u>22</u>	<u>15</u>	<u>20</u>	<u>52</u>	<u>60</u>	<u>56</u>	<u>82</u>

The games suggested on pages 71 to 79 should be used to motivate the work in column addition. The children should be encouraged to play them before and after school and at the noon intermission and the recess periods in order that the pupils may have more drill in adding than they get in the recitation period alone. Playing dominoes also gives an excellent drill in addition.

Find the sums of the following:

1.	2.	3.	4.	5.	6.	7.	8.
12	16	17	27	34	17	12	33
38	20	30	45	17	12	35	24
24	19	25	13	22	36	23	18
<u>43</u>	<u>10</u>	<u>16</u>	<u>14</u>	<u>26</u>	<u>12</u>	<u>19</u>	<u>15</u>

9.	10.	11.	12.	13.	14.	15.	16.
15	13	25	33	13	23	45	17
23	35	30	17	25	18	20	46
42	17	19	26	13	43	18	10
<u>13</u>	<u>25</u>	<u>27</u>	<u>19</u>	<u>26</u>	<u>15</u>	<u>16</u>	<u>23</u>

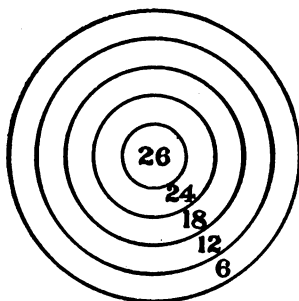
17.	18.	19.	20.	21.	22.	23.	24.
15	34	32	11	18	43	12	33
7	4	13	20	3	12	42	13
34	17	6	39	42	10	10	27
11	20	32	3	7	6	16	4
<u>26</u>	<u>3</u>	<u>16</u>	<u>14</u>	<u>24</u>	<u>15</u>	<u>5</u>	<u>19</u>

25.	26.	27.	28.	29.	30.	31.	32.
4	17	28	21	27	32	19	29
23	32	12	9	24	24	24	16
9	5	9	6	9	15	8	12
12	24	23	12	18	7	15	8
<u>25</u>	<u>13</u>	<u>7</u>	<u>25</u>	<u>6</u>	<u>13</u>	<u>7</u>	<u>25</u>

The adding of these scores gives sums in the units' column equal to more than 10. The *only new point* is the reduction of the sum of the units to tens and units. In problem 1, the sum of the units is 17. 17 = 1 ten and 7 units'. Place the 7 in units' place in the sum and, "carry" the 1 ten to the tens' column.

THIRD YEAR

THE BEANBAG GAME



With a string and a piece of chalk make five circles on the floor. Number the rings as shown in the illustration. Let each player have five turns at throwing a beanbag into the rings. A bag on a line is counted in the ring outside the line. Have a scorekeeper put down the scores for each player as shown below. The player with the largest sum wins.

Who won in these games? Add the scores and find out.

First Game

1. John	2. Ruth	3. Donald	4. Helen	5. Josephine
24	18	24	6	26
12	26	18	18	12
18	12	26	26	24
24	18	24	12	12
<u>6</u>	<u>24</u>	<u>12</u>	<u>18</u>	<u>18</u>

Second Game

1. Ruth	2. Wallace	3. Helen	4. Donald	5. John
24	18	12	18	18
6	24	24	18	26
26	12	18	24	26
24	12	12	26	12
<u>18</u>	<u>26</u>	<u>24</u>	<u>12</u>	<u>24</u>

278 Sum of units' column = 33. 33 = 3 tens and 3 units.
 97 Place 3 in units' column and "carry" 3 tens to tens'
 194 column. Sum of tens' column = 40. 40 = 4 hundreds
 77 and 0 tens. Place 0 in the tens' column and "carry"
 257 the 4 hundreds to hundreds' column. Sum of hundreds'
 903 column = 9. Write the 9 in hundreds' column.

Copy the following problems in *vertical columns* as shown above and add:

1. $59 + 376 + 61 + 92 + 289.$
2. $195 + 74 + 146 + 47 + 339.$
3. $279 + 86 + 96 + 244 + 137.$
4. $93 + 170 + 69 + 94 + 428.$
5. $45 + 278 + 140 + 28 + 389.$
6. $278 + 93 + 117 + 66 + 348.$
7. $462 + 70 + 53 + 237 + 68.$
8. $163 + 286 + 89 + 92 + 425.$
9. $74 + 317 + 73 + 198 + 245.$
10. $143 + 75 + 357 + 198 + 69.$
11. $256 + 197 + 80 + 275 + 79.$
12. $89 + 249 + 174 + 351 + 97.$
13. $54 + 64 + 355 + 98 + 438.$
14. $193 + 287 + 589 + 477 + 698.$
15. $533 + 756 + 452 + 968 + 193.$
16. $254 + 634 + 556 + 176 + 387.$
17. $936 + 477 + 745 + 887 + 322.$
18. $563 + 686 + 279 + 797 + 178.$
19. $369 + 465 + 865 + 389 + 598.$
20. $165 + 959 + 462 + 848 + 589.$
21. $259 + 886 + 789 + 399 + 462.$

ADDITION PROBLEMS

1. Janet, Lucile, and Margaret found three patches of violets in the woods. Janet picked 35 off her patch, Lucile picked 47, and Margaret picked 53. How many did they find altogether?

2. Harry saved 25 cents one week, 37 cents the next week, and 55 cents the next. How much did he save during the three weeks?

3. Ralph went with his parents to a summer resort on a lake. Here is his fishing record: Monday 13; Tuesday 17; Wednesday 11; Thursday 26; Friday 29, and Saturday 15. How many fish did he catch during the week?

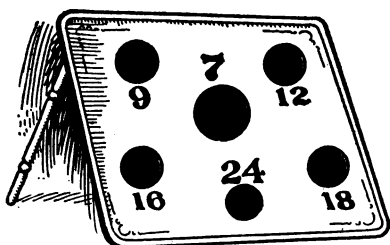
4. Here is the egg record of Ethel's flock of hens for one week: Monday 16, Tuesday 19, Wednesday 18, Thursday 15, Friday 21, Saturday 17, Sunday 18. Find the total number eggs laid during the week.

5. In a village school there are 38 pupils in the first room; 34 pupils in the second room; 31 pupils in the third room; and 29 pupils in the fourth room. How many pupils are there in this school?

6. The pupils in the third grade collected pictures of animals for their play circus. They had 12 elephants, 7 zebras, 5 giraffes, 17 monkeys, and 14 lions. How many pictures did they have altogether?

7. Lester drove the car part of the time on an auto trip so that his father could rest. The first day he drove 14 miles, the next day 16 miles, the third day 12 miles, and the fourth day 18 miles. How many miles did Lester drive in the four days?

8. Find the sum of 97, 64, 39, 43, and 78.



Instead of drawing circles on the floor as shown on page 74, you may play the beanbag game with this board.

1. Why should the largest hole have the smallest number and the smallest hole have the largest number?

2. Who in the class can make the highest score with 8 throws? — may be scorekeeper.

3. Choose the five with the largest sums and give them each 8 more throws to find the champion thrower.

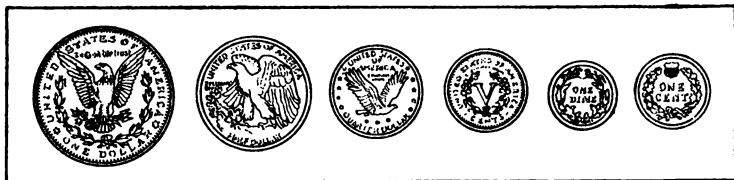
4. Divide the class into 2 or more teams. Have a contest for each team to choose a contestant in a final tournament to find the champion of the room.

This type of work should be made interesting so that the pupils will want to play it before and after school hours and at the noon intermission. If you do not have a beanbag board, have one of the boys make one. The girls can make the beanbags. They should be of a uniform size, of some firm material, and just large enough to hold $\frac{1}{2}$ pint of beans.

Who won this game?

Mary	Alice	Philip	Louise	Jack
7	7	7	0	7
0	7	24	18	24
18	0	0	0	7
7	12	12	7	0
0	0	7	0	7
9	7	0	0	16
7	16	9	12	7
<u>24</u>	<u>0</u>	<u>7</u>	<u>7</u>	<u>0</u>

U. S. MONEY



You have all seen the different coins which we use in buying things at a store. Name the different coins in the picture at the top of this page.

1. A nickel is worth how many cents?
2. How many nickels can you get for a dime?
3. A dime is worth how many cents?
4. If you give a storekeeper a quarter and ask for change, how many nickels can you get for it?

1 dollar = 2 half dollars = 4 quarters = 10 dimes = 20 nickels = 100 cents. What does the sign \$ stand for? (See page 59).

\$1.25 is read one dollar and twenty-five cents. The period between the 1 and the 2 is used to separate the number of dollars from the number of cents.

Read the following:

\$1.45	\$6.25	\$1.85	\$5.50	\$3.24
\$.80	\$3.10	\$1.05	\$3.15	\$1.17

Amounts less than one dollar are written in two ways: \$.05 or 5c.

Write: seven cents; forty-three cents; one dollar and forty-nine cents; nine cents; four dollars and seventy cents.

MAKING CHANGE

Suppose you buy 30 cents worth of groceries and give the storekeeper a dollar to pay for them. He will start with the cost of the groceries, saying **30**, give you a dime and say **40**, give you another dime and say **50**, and give you a half dollar and say **\$1.00**.

1. If you buy 15 cents worth of apples and give the grocer a half dollar, he will make change, saying 15, 25, 50. What coins would he give you as he says these sums?

2. Show how a hardware dealer would make change if you bought a fishing line for 15 cents and gave him a dollar to change.

3. If you buy 65 cents worth of groceries and offer a \$1 bill in payment, show how the grocer will count out your change.

4. You buy 10 cents worth of candy and give a half dollar to the grocer. Count out the change.

5. Count out the change for a dollar given to pay for a dozen oranges at 40 cents.

6. Play you are the cashier at a restaurant. Count out the change for a \$1 bill given to pay for a meal costing \$.35.

7. A bill of groceries amounted to \$1.43. A \$2 bill was given in payment. Count out the change.

8. Your purchase amounts to \$1.69 and you give a \$2 bill for payment. Count out the change.

Have the pupils bring in problems in *making change* based upon their own experiences. This work is very valuable and practical.

CHOOSING A LUNCH

Noon lunches are provided in many schools. In some schools the children can get a good lunch for from 10 to 15 cents. Here is a "Bill of Fare" for a school lunch room:

Soup, with crackers.....	\$0.04	Celery, per stalk.....	\$0.01
Meat pie.....	.05	Pickles or olives.....	.01
Irish stew and dumplings...	.09	Salad.....	.05
Meat stew with rice.....	.06	Bananas, each.....	.03
Meat loaf with potatoes....	.07	Sliced oranges.....	.04
Escalloped corn.....	.04	Cookies, each.....	.01
Baked potato.....	.03	Doughnuts, each.....	.02
Baked beans.....	.03	Rice pudding.....	.04
Bread and butter.....	.02	Ice cream.....	.05
Bun or roll with butter.....	.02	Cake.....	.04
Sandwiches.....	.04	Milk or cocoa.....	.04

1. Without a pencil, choose a 10c lunch.
2. Choose a lunch that will cost 15 cents.
3. What could you get for \$.12?
4. Harry selected the following lunches during one week:

Monday: Meat pie, escalloped corn, ice cream.

Tuesday: Meat loaf with potatoes, rice pudding, milk.

Wednesday: 1 sandwich, soup, salad, cake.

Thursday: Irish stew and dumplings, bread and butter, 1 banana.

Friday: Tomato soup, baked beans, ice cream, 1 doughnut.

Find the cost of his lunch each day at the prices given on the bill of fare. How much did Harry spend for his lunches during the week?

5. Select a lunch of the four things which you like best on the bill of fare. How much would it cost?

6. If you had only 9 cents to spend for a lunch, what would you select from this bill of fare?

If you have a lunch room in your school, use its bill of fare and have the pupils prepare and solve problems similar to those given above.

People who eat away from home in the large cities have to pay more for their meals than the prices charged in a school lunch room. Here is a bill of fare or menu of a restaurant:

Soup.....	\$0.10	Baked apple with cream....	\$0.15
Roast beef.....	.35	Waffles with syrup.....	.15
Turkey with cranberry sauce	.50	Buttered toast.....	.10
Small steak.....	.35	Cheese sandwich.....	.10
Liver and bacon.....	.30	Egg sandwich.....	.10
Ham and eggs.....	.45	Ham sandwich.....	.10
2 eggs, any style.....	.15	Lettuce and egg salad.....	.15
Hot cakes with syrup.....	.15	Rolls, each.....	.02
Hot cakes with sausage.....	.35	Pie, per cut.....	.10
Potatoes, baked or fried....	.10	Cake, per slice.....	.10
Baked beans.....	.10	Ice cream.....	.10
Baked apple.....	.10	Milk, cocoa or coffee.....	.05

Find the cost of the following meals for one day:

1. Breakfast

2. Lunch

3. Dinner

Baked apple with
cream
2 poached eggs
Buttered toast
Cocoa

Lettuce and egg
salad
2 rolls
Ice cream and
cake

Baked Potatoes
Steak
Baked beans
Pie
Milk

Find the cost of these meals:

4.

5.

Turkey with cranberry sauce
Lettuce and egg salad
Pie with ice cream
Coffee

Baked apple with cream
Hot cakes with country
sausage
Cocoa

6.

7.

8.

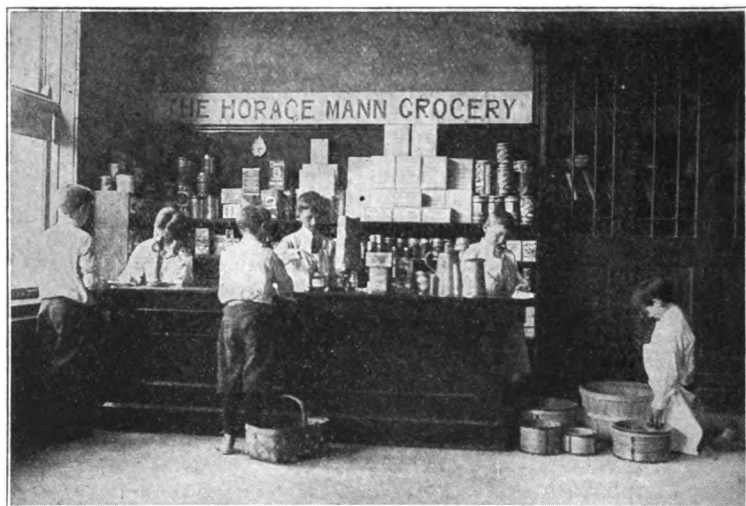
Buttered toast
2 poached eggs
Baked apple
A glass of milk

Soup
Small steak
Baked potato
Ice cream

Waffles
Ham and eggs
Pie
Coffee

THIRD YEAR

THE SCHOOL STORE



Can you make a school store like this in which to buy and sell real things? Write a list of articles you intend to have in stock, such as potatoes, flour, sugar, tea, etc.

Ask at home for things to sell in your store, such as empty cocoa tins, catsup and olive bottles, egg-boxes, tins which have held canned goods (if they are clean and have been carefully opened), pint and quart milk bottles, empty spice boxes, salt and flour sacks, breakfast food boxes, etc. You may be able to find some round stones about the size of eggs to serve as eggs. Sawdust and sand may be used to fill some of the sacks and packages. Water whitened with chalkdust may be milk.

Find the prices of whatever you bring and how it is sold, that is by the pound, by the peck, by the package, etc. It will be well also to list the prices of some things you may not be able to have in your store, such as head lettuce and other vegetables, fruits, etc.

An oral development of this idea is preferable to letting the children simply read these suggestions. Let them work out the essentials of the plan, the teacher directing the discussion along the lines suggested in the book and adding any other desirable features which may occur to her.

ORDERING GROCERIES

The careful housewife makes out a list before she orders her groceries. She either knows or asks the price of each commodity before she buys it. In this way she knows just how much she is spending. Here is an example of such a list:

1 doz. oranges.....	\$0.40
1 lb. butter.....	.57
1 tin cocoa.....	.35
1 peck of potatoes.....	.35
1 package yeast.....	.03
$\frac{1}{2}$ lb. cream cheese.....	.20

Total..... ?

Find the total cost of this list of groceries.

The grocer writes the order on a slip similar to the one shown on this page. Try to get some tablets of new order slips. Or bring some of the used ones your mother has at home and rule paper like them.

In playing store, have one customer at a time give his order to the storekeeper. The storekeeper or his clerk will make out the order slip and each pupil will put down the amounts

so that every pupil will add up the bills so that he can tell whether the clerk has figured the bill correctly. Make change in the way described on page 79. Use toy money in making change. If you do not have regular printed toy money, you can make some by drawing around regular coins on a piece of cardboard and then cutting out the circular pieces and labeling them 1 cent, 5 cents, 10 cents, etc.

HORACE MANN GROCERY		
BOSTON, MASS. <u>24</u> 1920		
Sold to <u>Mrs. F. W. Weaver</u>		
salesman <u>B.</u> Address <u>624 Centre St.</u>		
1	1 doz oranges	40
2	1 lb. butter	57
3	1 lb. cocoa	35
4	1 pk potatoes	35
5	1 yeast	03
6	$\frac{1}{2}$ lb. cream cheese	20
7		
8		
9		
10		

THE SCHOOL STORE

In keeping store you will find out these things:

5 cents = 1 nickel.	2 nickels = 1 dime.
10 cents = 1 dime.	5 nickels = 1 quarter.
25 cents = 1 "quarter."	5 dimes = 1 half dollar.
50 cents = 1 half dollar.	2 half dollars = 1 dollar.
100 cents = 1 dollar.	4 "quarters" = 1 dollar.
2 pints = 1 quart.	8 quarts = 1 peck.
4 quarts = 1 gallon.	4 pecks = 1 bushel.
12 things = 1 dozen.	16 ounces = 1 pound.
6 things = 1 half dozen.	8 ounces = $\frac{1}{2}$ pound.

ADDING GROCERY SLIPS

The following problems were taken from grocery slips. Add them from the bottom up and check your answers by adding from the top down:

1.	2.	3.	4.	5.	6.	7.
\$.35	\$.15	\$.15	\$.20	\$.45	\$ 1.20	\$.18
.37	.64	.24	1.18	.15	.64	.30
.17	.35	.17	.86	.04	.10	.45
<u>.20</u>	<u>.18</u>	<u>.35</u>	<u>.25</u>	<u>.65</u>	<u>.48</u>	<u>.22</u>
8.	9.	10.	11.	12.	13.	14.
\$.60	\$.75	\$.20	\$.10	\$.30	\$.18	\$.15
.10	.08	.60	.75	.07	.50	.76
.12	.90	.30	.11	.39	.15	1.18
.14	.17	.39	.16	1.20	.75	.12
<u>.24</u>	<u>.11</u>	<u>.22</u>	<u>.18</u>	<u>.86</u>	<u>.35</u>	<u>.75</u>

Show that "carrying" from the cents to the dollars is done in the same way as "carrying" from the tens to the hundreds.

ADDITION PROBLEMS

1. The third-grade decided to have a Christmas tree for their room. They spent \$1.75 for the tree, \$.95 for colored glass balls, \$.85 for tinsel cord, \$.24 for candle holders, and \$.36 for candles. The children also made other decorations at school. Jane's mother wished to buy it after the party and agreed to pay what the tree and decorations cost them. How much did they charge her?



2. The third-grade invited the fourth-grade to a Christmas party. There were 39 in the third-grade and 37 in the fourth-grade. The teacher provided a small bag of candy for each pupil. How many bags did she need?

3. Walter spent these amounts for Christmas presents: for mother \$1.25, for father \$.95, for sister \$.65, for grandma \$.85. How much did all of these presents cost him?

4. Edna bought two Christmas presents at a drug store, one costing \$.75 and the other costing \$.85. How much did both cost? She handed the clerk a \$2 bill. Count out the change as you would hand it to her if you were the clerk.

5. Find the sum of \$.75, \$.65, \$.45, and \$.95.

In adding sums of U. S. money be sure to keep the periods separating dollars and cents in a straight line so dollars will fall under dollars and cents under cents.

PRACTICE IN WRITTEN ADDITION

Add from the top down:

1.	2.	3.	4.	5.	6.	7.	8.
37	45	59	66	79	69	76	38
86	78	26	56	26	54	78	69
98	42	97	85	65	99	68	79
61	74	39	60	98	59	25	57
52	68	73	13	84	14	98	79
<u>76</u>	<u>59</u>	<u>12</u>	<u>98</u>	<u>78</u>	<u>77</u>	<u>98</u>	<u>89</u>
9.	10.	11.	12.	13.	14.	15.	16.
67	94	35	79	45	37	89	44
98	79	78	92	96	73	77	87
86	64	28	28	11	56	58	47
60	77	94	87	62	74	99	33
72	64	85	71	65	85	96	93
<u>98</u>	<u>96</u>	<u>86</u>	<u>20</u>	<u>88</u>	<u>98</u>	<u>92</u>	<u>91</u>

ADDITION PROBLEMS

1. Three classes of the Lincoln School had a picnic. How many lunches had to be provided for all of the following: third grade 39, fourth grade 37, fifth grade 36, teachers 5?

2. Roy, John, Frank, and Howard sat on a bench in the city park and counted the different kinds of cars as they went by. Roy counted 79 Fords; John counted 14 Buicks; Frank counted 17 Overlands, and Howard counted 77 cars of all other makes. How many did they count altogether?

3. Ethel worked 16 problems on Monday; 21 on Tuesday; 19 on Wednesday; 17 on Thursday, and 23 on Friday. Find the total number of problems for the five days.

4. Ray helped a gardener during his vacation. He worked 19 days in June, 25 days in July, and 17 days in August. How much did he make during the vacation if he received a dollar a day?



5. A nature-study class counted the trees in a grove near the city. One group reported 32 oaks, another 11 hickory trees; a third group counted 19 locust trees, and the other group found 97 trees of other kinds. How many trees of all kinds were there in the grove?

PRACTICE IN WRITTEN ADDITION

1.	2.	3.	4.	5.	6.
93	147	36	67	498	367
268	368	67	928	99	44
80	79	835	525	166	711
657	488	95	196	84	55
175	69	720	46	15	297
<u>79</u>	<u>64</u>	<u>97</u>	<u>837</u>	<u>722</u>	<u>586</u>
7.	8.	9.	10.	11.	12.
382	89	735	424	77	62
28	857	498	35	299	495
155	55	97	673	89	57
265	965	837	78	667	289
29	387	510	170	150	683
<u>791</u>	<u>88</u>	<u>92</u>	<u>94</u>	<u>69</u>	<u>178</u>

THIRD YEAR

WRITTEN ADDITION

Copy and add:

1.	2.	3.	4.	5.	6.
129	89	67	150	265	55
63	127	28	35	92	130
9	63	163	70	8	28
34	7	28	10	34	15
215	93	273	285	327	9
<u>97</u>	<u>463</u>	<u>304</u>	<u>95</u>	<u>35</u>	<u>83</u>

7.	8.	9.	10.	11.	12.
327	134	281	9	245	65
94	65	92	28	67	125
6	28	13	63	40	20
27	19	25	128	63	45
182	36	9	76	82	70
<u>263</u>	<u>327</u>	<u>173</u>	<u>593</u>	<u>430</u>	<u>325</u>

ADDITION OF U. S. MONEY

1.	2.	3.	4.	5.	6.
\$3.45	\$1.60	\$1.48	\$2.35	\$.85	\$3.50
.63	.35	.49	.79	.09	6.25
1.20	.25	2.80	.45	.59	1.69
.09	.15	.33	1.10	7.34	2.34
.85	3.25	5.50	1.27	2.65	7.60
<u>2.05</u>	<u>.18</u>	<u>.75</u>	<u>2.55</u>	<u>1.15</u>	<u>1.20</u>

7.	8.	9.	10.	11.	12.
\$1.50	\$1.05	\$2.50	\$.98	\$3.05	\$.65
3.50	.69	1.49	2.14	1.69	.37
.75	.35	.48	.87	.35	2.10
7.75	.18	.75	1.50	2.60	.63
.98	1.33	2.25	.98	.85	.95
<u>3.79</u>	<u>.81</u>	<u>.37</u>	<u>3.45</u>	<u>1.70</u>	<u>.36</u>

MAKING MONEY WITH A GARDEN.



1. John rented a plot of ground for a garden for \$4.25. He paid \$2.35 to have it plowed and harrowed. How much did he pay for rent, plowing, and harrowing?

2. He spent \$1.30 for seed potatoes, \$.80 for plants, and \$1.05 for seeds. How much

did he pay for seed and plants?

3. Add the sum of problem 1 to the sum of problem 2 to find his total expenses for the garden.

4. John bought 24 tomato plants, 48 cabbage plants, and 24 pepper plants. How many plants did he buy?

5. He sold one customer \$.35 worth of peas and \$.39 worth of tomatoes. She gave him a dollar. Play you are John and count out the change.

6. He sold another customer a peck of potatoes for \$.35 and a dozen ears of sweet corn for \$.25. She gave him a half dollar and a quarter. Count out the change.

7. John received the following amounts from the sale of his vegetables: potatoes \$12.75; peas \$1.65; squashes \$2.35; carrots \$1.75; cabbage \$4.16; peppers \$2.65; tomatoes \$3.15; other vegetables \$7.63. Find the total amount which he received for his vegetables.

8. He had \$29.34 in his savings account before he started gardening. He saved \$19.85 from his garden money and added it to his savings account. How much did he then have in his savings account?

SUBTRACTION

Use these drills for quick, snappy work at the beginning of each recitation. Since pupils take an added interest in working to reach a certain standard, the following time limits are suggested for oral work in the third grade: *Excellent* 45 seconds; *Good* 60 seconds; *Fair* 75 seconds.

DRILL 1

<u>7</u>	<u>10</u>	<u>5</u>	<u>14</u>	<u>10</u>	<u>11</u>	<u>3</u>	<u>17</u>	<u>11</u>	<u>9</u>	<u>6</u>
<u>6</u>	<u>6</u>	<u>3</u>	<u>6</u>	<u>8</u>	<u>4</u>	<u>2</u>	<u>9</u>	<u>7</u>	<u>3</u>	<u>1</u>
<u>13</u>	<u>3</u>	<u>8</u>	<u>11</u>	<u>15</u>	<u>18</u>	<u>9</u>	<u>7</u>	<u>16</u>	<u>8</u>	<u>11</u>
<u>4</u>	<u>0</u>	<u>3</u>	<u>6</u>	<u>9</u>	<u>9</u>	<u>6</u>	<u>7</u>	<u>7</u>	<u>6</u>	<u>9</u>
<u>10</u>	<u>3</u>	<u>14</u>	<u>6</u>	<u>12</u>	<u>14</u>	<u>15</u>	<u>5</u>	<u>12</u>	<u>6</u>	<u>16</u>
<u>2</u>	<u>1</u>	<u>9</u>	<u>5</u>	<u>5</u>	<u>7</u>	<u>7</u>	<u>0</u>	<u>9</u>	<u>4</u>	<u>9</u>

DRILL 2

<u>9</u>	<u>6</u>	<u>12</u>	<u>13</u>	<u>8</u>	<u>11</u>	<u>8</u>	<u>1</u>	<u>13</u>	<u>9</u>	<u>13</u>
<u>4</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>1</u>	<u>3</u>	<u>5</u>	<u>0</u>	<u>6</u>	<u>1</u>	<u>9</u>
<u>9</u>	<u>12</u>	<u>6</u>	<u>13</u>	<u>10</u>	<u>11</u>	<u>6</u>	<u>13</u>	<u>1</u>	<u>12</u>	<u>9</u>
<u>2</u>	<u>4</u>	<u>3</u>	<u>5</u>	<u>9</u>	<u>2</u>	<u>2</u>	<u>7</u>	<u>1</u>	<u>3</u>	<u>7</u>
<u>15</u>	<u>8</u>	<u>11</u>	<u>8</u>	<u>15</u>	<u>10</u>	<u>14</u>	<u>10</u>	<u>14</u>	<u>5</u>	<u>17</u>
<u>6</u>	<u>2</u>	<u>8</u>	<u>7</u>	<u>8</u>	<u>1</u>	<u>8</u>	<u>4</u>	<u>5</u>	<u>4</u>	<u>8</u>

DRILL 3

<u>11</u>	<u>7</u>	<u>16</u>	<u>16</u>	<u>9</u>	<u>9</u>	<u>7</u>	<u>15</u>	<u>11</u>	<u>8</u>	<u>2</u>
<u>9</u>	<u>3</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>6</u>	<u>2</u>	<u>9</u>	<u>5</u>	<u>3</u>	<u>0</u>
<u>13</u>	<u>10</u>	<u>9</u>	<u>7</u>	<u>17</u>	<u>10</u>	<u>11</u>	<u>5</u>	<u>14</u>	<u>9</u>	<u>10</u>
<u>4</u>	<u>7</u>	<u>3</u>	<u>1</u>	<u>9</u>	<u>5</u>	<u>4</u>	<u>2</u>	<u>6</u>	<u>5</u>	<u>6</u>
<u>8</u>	<u>12</u>	<u>10</u>	<u>13</u>	<u>7</u>	<u>13</u>	<u>7</u>	<u>11</u>	<u>12</u>	<u>13</u>	<u>4</u>
<u>0</u>	<u>4</u>	<u>3</u>	<u>9</u>	<u>5</u>	<u>6</u>	<u>4</u>	<u>3</u>	<u>8</u>	<u>8</u>	<u>2</u>

SUBTRACTION DRILLS

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DRILL 4

<u>12</u> <u>7</u>	<u>0</u> <u>0</u>	<u>16</u> <u>9</u>	<u>5</u> <u>3</u>	<u>12</u> <u>9</u>	<u>9</u> <u>4</u>	<u>15</u> <u>7</u>	<u>5</u> <u>5</u>	<u>12</u> <u>5</u>	<u>7</u> <u>3</u>	<u>14</u> <u>9</u>
<u>11</u> <u>7</u>	<u>17</u> <u>8</u>	<u>4</u> <u>1</u>	<u>14</u> <u>5</u>	<u>8</u> <u>1</u>	<u>14</u> <u>8</u>	<u>16</u> <u>8</u>	<u>7</u> <u>0</u>	<u>15</u> <u>8</u>	<u>15</u> <u>6</u>	<u>11</u> <u>8</u>
<u>10</u> <u>8</u>	<u>8</u> <u>5</u>	<u>12</u> <u>3</u>	<u>8</u> <u>4</u>	<u>13</u> <u>7</u>	<u>7</u> <u>2</u>	<u>11</u> <u>2</u>	<u>11</u> <u>6</u>	<u>13</u> <u>5</u>	<u>8</u> <u>8</u>	<u>9</u> <u>1</u>

DRILL 5

<u>10</u> <u>6</u>	<u>9</u> <u>2</u>	<u>14</u> <u>9</u>	<u>10</u> <u>7</u>	<u>4</u> <u>0</u>	<u>13</u> <u>5</u>	<u>18</u> <u>9</u>	<u>14</u> <u>6</u>	<u>10</u> <u>9</u>	<u>12</u> <u>5</u>	<u>2</u> <u>1</u>
<u>11</u> <u>2</u>	<u>7</u> <u>1</u>	<u>11</u> <u>4</u>	<u>8</u> <u>6</u>	<u>15</u> <u>7</u>	<u>3</u> <u>3</u>	<u>13</u> <u>7</u>	<u>6</u> <u>2</u>	<u>17</u> <u>9</u>	<u>5</u> <u>2</u>	<u>12</u> <u>9</u>
<u>9</u> <u>0</u>	<u>12</u> <u>3</u>	<u>10</u> <u>2</u>	<u>9</u> <u>3</u>	<u>9</u> <u>7</u>	<u>16</u> <u>9</u>	<u>4</u> <u>3</u>	<u>15</u> <u>6</u>	<u>9</u> <u>5</u>	<u>13</u> <u>4</u>	<u>6</u> <u>5</u>

DRILL 6

<u>12</u> <u>7</u>	<u>6</u> <u>0</u>	<u>11</u> <u>8</u>	<u>8</u> <u>2</u>	<u>8</u> <u>3</u>	<u>10</u> <u>3</u>	<u>13</u> <u>8</u>	<u>4</u> <u>4</u>	<u>15</u> <u>8</u>	<u>14</u> <u>7</u>	<u>15</u> <u>9</u>
<u>10</u> <u>1</u>	<u>11</u> <u>3</u>	<u>5</u> <u>1</u>	<u>14</u> <u>8</u>	<u>9</u> <u>6</u>	<u>7</u> <u>5</u>	<u>13</u> <u>6</u>	<u>6</u> <u>4</u>	<u>12</u> <u>6</u>	<u>14</u> <u>5</u>	<u>10</u> <u>4</u>
<u>16</u> <u>7</u>	<u>12</u> <u>8</u>	<u>13</u> <u>9</u>	<u>2</u> <u>2</u>	<u>17</u> <u>8</u>	<u>11</u> <u>5</u>	<u>11</u> <u>9</u>	<u>6</u> <u>1</u>	<u>12</u> <u>4</u>	<u>9</u> <u>8</u>	<u>9</u> <u>2</u>

These subtraction drills are planned to give extra emphasis to the *difficult* subtraction facts by including them *3 times as frequently* as the easy subtraction facts. Practice on these drills will give the pupils excellent preparation for doing the longer subtraction problems. For written work allow one and two-fifths as long as the oral time limits.

PROBLEMS IN SUBTRACTION

1. In a certain country school there is a noon recess of 45 minutes. The children use 20 minutes in eating their lunches. How many minutes are left for play?

45 minutes.

20 minutes.

25 minutes.

Explanation:¹ 0 units from 5 units leaves 5 units. 2 tens from 4 tens leaves 2 tens. The remainder = 25 minutes.

2. There are 28 children altogether in this school and 6 of them are in the first grade. When the first-grade children are out on the playground, how many children are left in the room?

3. Twelve of the 28 children live along one road. How many of them live on the other roads?

4. One day there was such a deep snow that only 14 of the older children could get to school. How many were absent that day?

Subtract the following:

5.	6.	7.	8.	9.	10.	11.	12.
60	47	98	87	77	74	99	82
<u>30</u>	<u>23</u>	<u>54</u>	<u>52</u>	<u>15</u>	<u>53</u>	<u>38</u>	<u>51</u>
13.	14.	15.	16.	17.	18.	19.	20.
48	72	38	96	69	97	96	76
<u>23</u>	<u>30</u>	<u>26</u>	<u>54</u>	<u>30</u>	<u>70</u>	<u>84</u>	<u>43</u>

¹ Both the additive and "taking-away" methods are given in this text so that teachers may use the one required by their course of study. Pupils should be taught *only one* of these explanations: *Additive Method*: What added to 0 makes 5? Write the answer 5 in units' place. What added to 2 makes 4? Write the 2 in tens' place. The remainder = 25 minutes.

1. In a city school 2 rooms of the same grade use together a set of 43 readers. When one room is using 28 of the books, how many are left on the shelf?

43 books.
28 books.
15 books.

Explanation:¹ We cannot take 8 units from 3 units, so we change one of the four tens to 10 units. We already had 3 units. 10 units and 3 units = 13 units.

We now have:

43 = 3 tens and 13 units.
28 = 2 tens and 8 units.

15 = 1 ten and 5 units.

2. Robert is setting out 36 cabbage plants for his father. When he has set out 17, how many has he yet to plant?

3. There were 42 pieces of chalk in the chalk box. At the beginning of the week, Marjorie took out 14 pieces to put in the chalk trays. How many pieces were left in the box?

4. There are 35 pupils in both sections of a third grade. If one section contains 16 pupils, how many are left in the other section?

¹ Teachers who prefer the additive method to the taking-away method may substitute the following explanation:

43 minuend
28 subtrahend
15 remainder

The remainder of a subtraction problem is a number which added to the subtrahend will give the minuend. What number added to the 8 in units' place will give a 3 ending? 8 and 5 are 13. Write the 5 in units' place of the remainder and "carry" the 1 ten (of the 13 units) to the tens' column. 2 tens + 1 ten = 3 tens. 3 and 1 are 4. Write the 1 in tens' place of the remainder. The remainder is 1 ten and 5 units or 15.

PRACTICE IN SUBTRACTION

1. 78 <u>69</u>	2. 91 <u>34</u>	3. 72 <u>25</u>	4. 57 <u>48</u>	5. 45 <u>16</u>	6. 44 <u>29</u>	7. 76 <u>19</u>	8. 63 <u>44</u>
9. 83 <u>27</u>	10. 52 <u>14</u>	11. 74 <u>36</u>	12. 54 <u>35</u>	13. 53 <u>29</u>	14. 96 <u>40</u>	15. 81 <u>42</u>	16. 65 <u>19</u>
17. 36 <u>17</u>	18. 61 <u>33</u>	19. 77 <u>59</u>	20. 95 <u>47</u>	21. 93 <u>58</u>	22. 97 <u>80</u>	23. 95 <u>28</u>	24. 93 <u>65</u>
25. 94 <u>78</u>	26. 99 <u>20</u>	27. 81 <u>58</u>	28. 83 <u>66</u>	29. 62 <u>23</u>	30. 98 <u>60</u>	31. 82 <u>17</u>	32. 32 <u>29</u>
33. 71 <u>49</u>	34. 93 <u>30</u>	35. 81 <u>37</u>	36. 91 <u>70</u>	37. 41 <u>36</u>	38. 24 <u>17</u>	39. 99 <u>59</u>	40. 60 <u>54</u>
41. 90 <u>16</u>	42. 80 <u>72</u>	43. 96 <u>88</u>	44. 94 <u>10</u>	45. 62 <u>38</u>	46. 60 <u>27</u>	47. 81 <u>35</u>	48. 70 <u>53</u>

The terms "minuend," "subtrahend," "minus," "difference," etc., are to be introduced *as need for their use arises*. The children often adopt such terms from hearing them spoken of, becoming in a measure familiar with them before it is necessary to explain their exact meaning. The children's experience then enables them to formulate a simple definition of their own, such as: "The minuend is the larger number," to which the teacher might add, "And the word *minuend* means something to be *diminished* or made less." Similarly the children may define the "subtrahend" as the "smaller number," the teacher supplementing with "*Subtrahend* means something to be *subtracted* or taken away."

SUBTRACTION PROBLEMS

1. A certain school had 605 pupils. In February it sent 24 to the high school. There was no entering first-grade class. How many pupils were then in the school?

$$\begin{array}{r} 605 \text{ pupils} \\ 24 \text{ pupils} \\ \hline ? \text{ pupils} \end{array}$$

2. There are 365 days in a year. Many schools have a school year of 195 days. How many days in the year are left for Saturdays, Sundays, holidays, and vacations?

$$\begin{array}{r} 365 \text{ days} \\ 195 \text{ days} \\ \hline \end{array}$$

3. In a number of schools the school year consists of only 189 days. How many days in the year are left in these schools for holidays, vacations, Saturdays, and Sundays?

4. Many country schools are in session only 160 days in a year. During how many days in the year is there no school in those schools?

5. In a village school there is an attendance of 352 pupils. Of this number 169 are boys. Find the number of girls in this school.

Problems 1 and 2 introduce the third type of subtraction problems—those in which the tens' figure in the minuend is smaller than the ten's figure of the subtrahend. Problems 3 and 5 illustrate the fourth type, in which both the units' and tens' figures of the minuend are smaller than the corresponding figures of the subtrahend. Develop these problems in a similar manner to the development shown on page 93.

PRACTICE IN WRITTEN SUBTRACTION

1. 188 <u>93</u>	2. 109 <u>23</u>	3. 106 <u>92</u>	4. 114 <u>47</u>	5. 109 <u>84</u>	6. 130 <u>87</u>	7. 108 <u>35</u>
8. 119 <u>52</u>	9. 110 <u>81</u>	10. 141 <u>73</u>	11. 133 <u>59</u>	12. 186 <u>99</u>	13. 151 <u>82</u>	14. 134 <u>75</u>
15. 127 <u>98</u>	16. 162 <u>74</u>	17. 145 <u>49</u>	18. 163 <u>85</u>	19. 119 <u>63</u>	20. 128 <u>79</u>	21. 139 <u>66</u>
22. 152 <u>79</u>	23. 109 <u>64</u>	24. 122 <u>43</u>	25. 121 <u>67</u>	26. 104 <u>47</u>	27. 190 <u>92</u>	28. 184 <u>96</u>
29. 848 <u>562</u>	30. 839 <u>145</u>	31. 686 <u>427</u>	32. 737 <u>149</u>	33. 947 <u>189</u>	34. 925 <u>629</u>	35. 949 <u>391</u>
36. 926 <u>539</u>	37. 735 <u>236</u>	38. 657 <u>258</u>	39. 945 <u>257</u>	40. 744 <u>478</u>	41. 902 <u>667</u>	42. 605 <u>388</u>
43. 743 <u>596</u>	44. 702 <u>149</u>	45. 556 <u>409</u>	46. 752 <u>560</u>	47. 905 <u>459</u>	48. 506 <u>207</u>	49. 907 <u>688</u>

Show the pupils how to *check* subtraction problems by adding the remainder and subtrahend and comparing the sum with the minuend. If the additive method is used for subtraction, the check will be merely a check of the addition.

1. In a spelling test of 20 words, Janet had 15 subtracted from a perfect mark of 100, because she misspelled 3 words. What was the grade on her paper?

$$\begin{array}{r} 100 \\ - 15 \\ \hline 85 \end{array}$$

Explanation: Change the 1 hundred to 10 tens. Now change one of the tens to 10 units. We now have:

$$100 = 9 \text{ tens and } 10 \text{ units.}$$

$$15 = 1 \text{ ten and } 5 \text{ units.}$$

$$\hline 85 = 8 \text{ tens and } 5 \text{ units.}$$

2. In a test of 25 words, each misspelled word counted off 4. Henry missed 3 words and had 12 taken away from 100. What was his mark?

3. Andrew, who is a very poor speller, had 44 subtracted from 100. Find his grade.

Subtract:

4.	5.	6.	7.	8.	9.	10.
$\begin{array}{r} 100 \\ - 26 \\ \hline \end{array}$	$\begin{array}{r} 100 \\ - 72 \\ \hline \end{array}$	$\begin{array}{r} 200 \\ - 148 \\ \hline \end{array}$	$\begin{array}{r} 300 \\ - 127 \\ \hline \end{array}$	$\begin{array}{r} 200 \\ - 156 \\ \hline \end{array}$	$\begin{array}{r} 400 \\ - 172 \\ \hline \end{array}$	$\begin{array}{r} 900 \\ - 346 \\ \hline \end{array}$
11.	12.	13.	14.	15.	16.	17.
$\begin{array}{r} 900 \\ - 119 \\ \hline \end{array}$	$\begin{array}{r} 800 \\ - 453 \\ \hline \end{array}$	$\begin{array}{r} 700 \\ - 322 \\ \hline \end{array}$	$\begin{array}{r} 600 \\ - 184 \\ \hline \end{array}$	$\begin{array}{r} 500 \\ - 371 \\ \hline \end{array}$	$\begin{array}{r} 900 \\ - 397 \\ \hline \end{array}$	$\begin{array}{r} 800 \\ - 206 \\ \hline \end{array}$
18.	19.	20.	21.	22.	23.	24.
$\begin{array}{r} 1000 \\ - 671 \\ \hline \end{array}$	$\begin{array}{r} 1100 \\ - 379 \\ \hline \end{array}$	$\begin{array}{r} 1200 \\ - 546 \\ \hline \end{array}$	$\begin{array}{r} 1300 \\ - 864 \\ \hline \end{array}$	$\begin{array}{r} 2000 \\ - 1375 \\ \hline \end{array}$	$\begin{array}{r} 5000 \\ - 2648 \\ \hline \end{array}$	$\begin{array}{r} 9000 \\ - 7106 \\ \hline \end{array}$

These problems introduce the fifth type of problems in subtraction, in which there is a zero in both units' and tens' places in the minuend. In using the additive method for this type of problem, proceed as in the explanation on page 93.

PROBLEMS IN SUBTRACTION

1. Frank weighs 69 pounds and his father weighs 156 pounds. His father is how many pounds heavier?
2. Arthur raised 173 spring chickens and sold 87 of them to a hotel. How many had he left?
3. Walter set 52 eggs under four hens and only 47 of them hatched. How many did not hatch?
4. Edward got 93 eggs from his flock of hens one week. He set 39 of them and sold the remainder. How many eggs did he sell that week?
5. Roy earned 90 cents mowing lawns one Saturday. He bought a pocket knife with 65 cents of the money. How much did he have left out of his day's earnings?
6. Ben earned \$56 during the summer vacation. His sister earned \$39. How much more did Ben earn during the vacation than his sister?
7. Harold bought a pocket knife for 85 cents and handed the clerk a dollar. How many cents are there in a dollar? How many cents should he receive in change?
8. Henry bought a jointed fishing pole for 65 cents. He gave the clerk a dollar. How much change should he have received?
9. Find the change due from a \$2.00 bill when an article is bought that costs \$1.69.

Have pupils collect problems from their parents or friends that involve subtraction. Insist that these problems be made from actual experiences and not "made-up" problems. Some of the best of these problems should be filed away by the teacher for use as supplementary problems by other classes in that subject.

REVIEW PROBLEMS

1. Alice bought some groceries for her mother. She bought a dozen oranges for \$.45, a head of lettuce for \$.08, three pounds of peas for \$.25, and other groceries amounting to \$.39. How much did she spend for these groceries?

2. Alice gave the clerk \$1.50 to pay for the groceries described in the preceding problem. How much change should she have received?

3. William's father bought him a suit for \$12.50, a cap for \$1.25, a pair of shoes for \$4.75, and an overcoat for \$15.00. Find the total cost of these clothes.

4. Helen's father weighs 178 pounds and her mother weighs 129 pounds. How many pounds heavier is her father than her mother?

5. There were 57 passengers on a street car. 9 more entered the car at the next stop and 18 left the car. How many were then on the car?

6. The attendance in a village school, including the high school, was 314. There were 229 pupils in the grades. How many were there in the high school?

7. A farmer owned 27 head of cattle and bought 18 head more. How many head of cattle did he then have?

8. A standard bale of cotton weighs 500 pounds. A farmer sold a bale which weighed only 487 pounds. How many pounds underweight was this bale?

9. A dairyman bought three cows at a sale for \$155, \$178, and \$136. Find the total cost of the three cows.

REVIEW PROBLEMS

10. Albert made the following scores in playing dominoes: 28, 19, 12, 9, 23. Find the sum of his scores.

11. How many more points did he need to make to have a hundred?

12. Henry, who was playing with Albert, had a total score of 72. How many points did he need to make 100?

13. Mabel arranged her mother's fruit on the shelves in the fruit room. There were 16 quarts of cherries, 13 quarts of raspberries, 25 quarts of peaches, 14 quarts of pears, 9 quarts of grapes, and 17 quarts of other kinds of fruit. How many quarts of fruit did she have altogether?

14. Fred went with his parents on an auto trip to visit his grandmother. The first day they went 187 miles. If the total distance was 365 miles, how far did they have left to go at the end of the first day?

15. Harry gathered the eggs for his mother. On Monday he found 28; on Tuesday 34; Wednesday 29; Thursday 31, and Friday 27. How many eggs did he find in the five days?

16. Edna added up the expenses of her family for a year. They spent \$300 for house rent; \$384 for food; \$295 for clothing, and \$267 for other expenses. Find the total expenses for her family.

17. If Edna's father's salary was \$1500 a year, how much could they save with their expenses as given in the preceding problem?

18. Find the difference between \$605 and \$497.

PRODUCTS CONTAINING THE FACTOR TWO



Give the products:

Two 5's = ?	Two 3's = ?
Two 2's = ?	Two 6's = ?
Two 7's = ?	Two 10's = ?
Two 1's = ?	Two 4's = ?
Two 8's = ?	Two 9's = ?

If the children do not remember the 2's, develop as suggested on page 51.

ORAL PROBLEMS

1. Edna picked strawberries in a gallon pail. She found that a pail full filled 4 quart boxes. How many quart boxes could she fill with 2 gallon pails full?
2. How many gloves are there in 2 pairs?
3. How many days are there in 2 weeks?
4. There are 8 quarts in a peck. Fred gathered 2 pecks of hickory nuts one afternoon. How many quarts did he gather?
5. How many players are needed to make 2 baseball teams of 9 players each?
6. How many cents can be obtained in change for 2 nickels?
7. Girls' basket ball teams are made up of 6 players in each team. How many players are needed for 2 teams?
8. How many pennies can be obtained in change for 2 dimes?
9. Mabel bought 2 pairs of roller skates at \$3 per pair for her sister and herself. How much did the 2 pairs cost?

MULTIPLICATION

2 Add the ten 2's in the first column at
 2 2 the left. Ten 2's=? Add the other two
 2 2 2 columns. Nine 2's=? Eight 2's=?

2 2 2 Every time we want to know how much
 2 2 2 ten 2's make, we cannot take the time to
 2 2 2 write down ten 2's and add them. We
 2 2 2 remember that ten 2's or 10 *times* 2=20.

2 2 2 This shortened form of addition is called
 2 2 2 *multiplication*.

— — — The sign $\times$ is read *times*. The expres-
 sion 10 times 2=20 may be written in the
 short form $10 \times 2 = 20$.

10 and 2 are called the *factors* of the *product* 20.

1. Compare the product of ten 2's with the product of two 10's which you found on the preceding page.

2. Compare the product of nine 2's with the product of two 9's.

3. How does 8×2 compare with 2×8 ?

4. By means of addition find the following:

Seven 2's = ?

Six 2's = ?

Three 2's = ?

Four 2's = ?

5. Compare these products with the corresponding facts on page 101.

The multiplication facts in this text are presented in a miscellaneous arrangement so that the pupil will master them as isolated facts. This is the way the pupil meets them in longer multiplication problems. After the facts have been presented in this way they may also be formed into a multiplication table arranged in regular order. (See next page.)

$2 \times 1 = ?$	$2 \times 6 = ?$	$1 \times 2 = ?$	$6 \times 2 = ?$
$2 \times 2 = ?$	$2 \times 7 = ?$	$2 \times 2 = ?$	$7 \times 2 = ?$
$2 \times 3 = ?$	$2 \times 8 = ?$	$3 \times 2 = ?$	$8 \times 2 = ?$
$2 \times 4 = ?$	$2 \times 9 = ?$	$4 \times 2 = ?$	$9 \times 2 = ?$
$2 \times 5 = ?$	$2 \times 10 = ?$	$5 \times 2 = ?$	$10 \times 2 = ?$

Have the pupils make a multiplication table like the one shown above and fill in the products. Have them refer back to addition for any fact which they do not remember.

ORAL REVIEW PROBLEMS

1. How many roller skates are there in 3 pairs?
2. How much do 4 postage stamps cost at 2 cents each? How much do 5 cost?
3. Find the cost of 6 picture postal cards at 2 cents each. Of 8 such cards.
4. William bought 7 marbles at 2 cents each. How much did he pay for his whole set of 7?
5. Frank bought some marbles at 2 for a cent. How many marbles did he get for 8 cents?
6. How many cents must you give the store-keeper if you buy 9 candles at 2 cents each?
7. How many horses are needed for a dray wagon? How many horses does a man need for 2 dray wagons?

ZERO AS A FACTOR

If you have no dollars or 0 dollars and I have 2 times as much, how much do I have? $2 \times 0 = 0$. *Any number times 0 or zero times any number gives zero (0) as a product.*

DRILL EXERCISE

Multiply:

1	2	9	2	8	2	5	0	8	2	2
2	4	2	6	2	3	2	2	2	2	5
6	2	2	9	5	2	4	5	2	8	2
2	9	0	2	2	0	2	2	3	2	1
5	3	6	2	8	4	2	5	2	4	3
2	2	2	9	2	2	6	2	8	2	2

TWO AS A DIVISOR

1. If Harry earns 2 dimes a day for delivering papers, in how many days will he earn 18 dimes in that way?

It will take him as many days as there are 2's in 18. From our multiplication facts we know that nine 2's equal 18. If we did not remember this fact, we could also find it out by *dividing* the 18 dimes into piles of 2 dimes each and counting the number of piles. We express the *division* in this way: $18 \div 2 = 9$.

The sign $\div$ is read *divided by*.

In this division the 2 is called the *divisor*, the 18 is called the *dividend*, and the 9 is called the *quotient*. It is necessary that we have some names to use in talking about the various parts of a division problem and these names are the ones which everybody uses.

2. A quart is equal to 2 pints. How many quarts are there in 16 pints? $16 \div 2 = ?$

Name the divisor, the dividend, and the quotient in this problem.

3. By referring back to the multiplication with twos, find the quotients of these division facts:

$$\begin{array}{llll} 6 \div 2 = ? & 4 \div 2 = ? & 8 \div 2 = ? & 2 \div 2 = ? \\ 14 \div 2 = ? & 18 \div 2 = ? & 16 \div 2 = ? & 10 \div 2 = ? \\ 10 \div 2 = ? & 12 \div 2 = ? & 20 \div 2 = ? & 12 \div 2 = ? \end{array}$$

When we divide a number by 2, we see that the quotient is *one-half* of the number. For example: $6 \div 2 = 3$. 3 is $\frac{1}{2}$ of 6. Instead of writing the problem $6 \div 2 = 3$ we may say $\frac{1}{2}$ of 6 = 3.

4. It is 14 miles from one city to another. There is a small station halfway between the two cities. How far is it from the station to either city? $\frac{1}{2}$ of 14 miles = how many miles?

5. Write the quotients of the following:

$$\begin{array}{lll} \frac{1}{2} \text{ of } 8 = ? & \frac{1}{2} \text{ of } 10 = ? & \frac{1}{2} \text{ of } 6 = ? \\ \frac{1}{2} \text{ of } 12 = ? & \frac{1}{2} \text{ of } 4 = ? & \frac{1}{2} \text{ of } 16 = ? \\ \frac{1}{2} \text{ of } 18 = ? & \frac{1}{2} \text{ of } 20 = ? & \frac{1}{2} \text{ of } 2 = ? \end{array}$$

HELPING MOTHER

6. Roberta wished to help her mother. Her mother said: "You may sort the stockings in my sewing basket in pairs." Roberta found 18 stockings in the basket. How many pairs were there?

$$18 \div 2 = ?$$



7. Her mother then told her to take the empty fruit jars to the basement. She carried 2 each trip. How many trips did she make if there were 8 jars?

DIVISION FACTS

8. Then Roberta put the hall clothes-closet in order. The boys had thrown roller skates and rubbers together in a pile. She found 6 skates and put them neatly side by side in pairs. How many pairs were there?

9. There were 10 rubbers. When Roberta matched them, how many pairs did she have?

10. After that she went to the box where her shoes and her sister Jane's were kept. Roberta counted 12 altogether. How many pairs were there?

11. Her mother's glove box was in good order, but Roberta took out the 8 gloves anyway and put them back again. How many pairs of gloves were in the box?

These problems are of the *measuring* type of division. This is the type which usually gives children trouble in applied problems. Assist them in seeing the problem by referring back to the multiplication fact, as: how many 2's make 8?

7 The division problem $14 \div 2$ may also be written in
 $2 \overline{)14}$ the form shown at the left end of this line. The quotient,
 7, goes over the 4 of the dividend because it is 7 units
 and must be placed in units' column.

$0 \div 2 = ?$ How many times could you take 2 dollars out of your pocket if you had 0 dollars in it? Then $0 \div 2 = 0$. $0 \div \text{any number}$ gives 0 for a quotient.

Divide:

$2 \overline{)4}$	$2 \overline{)12}$	$2 \overline{)18}$	$2 \overline{)2}$	$2 \overline{)10}$	$2 \overline{)14}$	$2 \overline{)16}$
$2 \overline{)0}$	$2 \overline{)6}$	$2 \overline{)16}$	$2 \overline{)14}$	$2 \overline{)8}$	$2 \overline{)18}$	$2 \overline{)20}$

PRODUCTS CONTAINING THE FACTOR THREE

3	6	4	9	7	10	5	8
3	6	4	9	7	10	5	8
<u>3</u>	<u>6</u>	<u>4</u>	<u>9</u>	<u>7</u>	<u>10</u>	<u>5</u>	<u>8</u>

Instead of always stopping to add three 8's when we want to know the product, we must remember the result after we have found it by adding in order that we may save time. Just as addition is a short method of counting, so *multiplication* is a short form of addition.

Use the problems at the top of the page to find any of these products which you do not know:

Three 1's = ?	Three 5's = ?
Three 4's = ?	Three 8's = ?
Three 6's = ?	Three 3's = ?
Three 9's = ?	Three 7's = ?
Three 2's = ?	Three 10's = ?

ORAL PROBLEMS

1. How many days are there in 3 weeks?
2. How many tires are there on an automobile?
How many tires are there on 3 automobiles?
3. Robert earned \$6 a week for 3 weeks during his vacation by helping a truck gardener. How much did he earn in the three weeks?
4. This figure is called a triangle. How many lines or sides has it? How many lines are drawn in making 3 triangles?



MULTIPLICATION FACTS

5. What is the cost of 3 tablets at 10 cents apiece?

6. Three families live in an apartment building. There are 5 persons in each family. How many are there in the 3 families?

7. How much do 3 apples cost at 8 cents each?

8. Henry has 3 rows of tomato plants in his garden with 9 plants in each row. How many tomato plants does he have altogether?

WRITTEN PRACTICE WITH THE 3'S

1. Copy and write the products:

4	7	2	9	1	5	3	6	10	8
<u>3</u>	<u>3</u>	<u>3</u>	<u>3</u>	<u>3</u>	<u>3</u>	<u>3</u>	<u>3</u>	<u>3</u>	<u>3</u>

2. Supply the missing numbers in these multiplication facts:

?	?	?	?	?	?	?	?	?	?
<u>3</u>	<u>3</u>	<u>3</u>	<u>3</u>	<u>3</u>	<u>3</u>	<u>3</u>	<u>3</u>	<u>3</u>	<u>3</u>
15	12	9	18	24	30	3	27	6	21

REVIEW

Multiply:

7	9	3	2	8	4	6	2	7	5	6	10
<u>3</u>	<u>2</u>	<u>3</u>	<u>9</u>	<u>3</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>2</u>	<u>3</u>	<u>2</u>	<u>3</u>
2	9	5	1	2	2	10	4	2	1	2	8
<u>6</u>	<u>3</u>	<u>2</u>	<u>3</u>	<u>5</u>	<u>2</u>	<u>2</u>	<u>3</u>	<u>10</u>	<u>2</u>	<u>3</u>	<u>2</u>
3	2	7	9	9	8	8	7	5	2	4	2
<u>2</u>	<u>8</u>	<u>3</u>	<u>2</u>	<u>3</u>	<u>2</u>	<u>3</u>	<u>2</u>	<u>3</u>	<u>8</u>	<u>3</u>	<u>9</u>

1. By means of addition as shown on page 102, find the product of nine 3's. Compare this product with the product of three 9's.

2. Compare 7×3 with 3×7 .

3. Compare 4×3 with 3×4 .

4. Compare six 3's with three 6's.

5. Compare ten 3's with three 10's.

6. How does the product of five 3's compare with the product of three 5's?

7. How does the product of eight 3's compare with the product of three 8's?

Have the pupils see clearly that the product of two numbers is the same regardless of which is considered to be the multiplier. When we see 4 and 3 as factors, we should think 12 as the product regardless of whether they are arranged 3×4 or 4×3 .

8. Give the missing numbers in these multiplication facts:

9	3	4	?	3	5	10	3	?	3
3	?	3	3	?	3	3	9	3	8
?	24	?	18	21	?	?	?	6	?

9. Make a table like the following and fill in the products:

$3 \times 1 = ?$	$3 \times 6 = ?$	$1 \times 3 = ?$	$6 \times 3 = ?$
$3 \times 2 = ?$	$3 \times 7 = ?$	$2 \times 3 = ?$	$7 \times 3 = ?$
$3 \times 3 = ?$	$3 \times 8 = ?$	$3 \times 3 = ?$	$8 \times 3 = ?$
$3 \times 4 = ?$	$3 \times 9 = ?$	$4 \times 3 = ?$	$9 \times 3 = ?$
$3 \times 5 = ?$	$3 \times 10 = ?$	$5 \times 3 = ?$	$10 \times 3 = ?$

This table may also be written in the form three 7's = ? Pupils should be required to give this form in drill work as well as 3 times 7 = ?

ORAL PROBLEMS



1. John's father bought 6 barrels of apples for their winter's use. Each barrel holds 3 bushels. How many bushels did he buy?

2. The third grade of a city school measured the width of the schoolroom and found it to be 9 yards wide. A yard equals how many feet? How many feet wide was the room?

3. How much will 7 yards of Christmas tinsel cord cost at 3 cents a yard?

4. George's garden plot is 8 yards long. How many feet long is it?

5. Find the cost of 5 apples at 3 cents each.

6. Ella found 4 peanuts with 3 kernels in each hull. How many kernels did she get from the 4 peanuts?

7. Ten pupils in the drawing class made 3 stars apiece for the Christmas tree. How many stars did they all make?

DRILL EXERCISES

Multiply:

2	5	8	3	9	7	5	3	6	2	3	4
4	3	2	8	2	2	2	9	3	6	6	2
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
3	8	2	3	3	8	3	3	8	6	9	2
5	2	5	8	2	3	6	2	3	2	3	3
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
4	2	3	9	2	3	7	2	7	3	3	8
3	7	4	3	8	7	3	9	0	3	9	3
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>

THREE AS A DIVISOR

1. Four 3's are —? Think of making triangles on your desk using 12 pegs. How many triangles could you make? $12 \div 3 = ?$

2. Six 3's are —? How many triangles can you make with 18 pegs? $18 \div 3 = ?$

3. Three 3's are —? If you have 9 apples, how many children can you give 3 apiece? $9 \div 3 = ?$

4. Ten 3's = —? There are 30 pupils in a room. When arranged 3 abreast, their line will be — deep? $30 \div 3 = ?$

5. Eight 3's are —? 24 children standing 3 abreast make a line how deep? $24 \div 3 = ?$

6. Seven 3's are —? A man gave each of his children 3 dollars. It took 21 dollars to go around. How many children did he have? $21 \div 3 = ?$

7. Nine 3's are —? With 27 cookies, how many children can have 3 cookies apiece? $27 \div 3 = ?$

8. Five 3's = —? With 15 sticks of candy, how many children can have 3 sticks apiece? $15 \div 3 = ?$

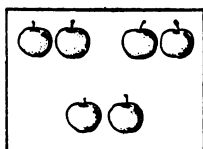
9. Four 3's are —? How many times must I take 3 eggs out of a box to have a dozen eggs? $12 \div 3 = ?$

10. Eight 3's are —? How many times should I have to take 3 eggs out of the box to have 24 eggs?

11. Five 3's are —? How many picture postals at 3 cents each can I buy for 15 cents? $15 \div 3 = ?$

The teacher should bear in mind the difference between the division problems on this page and those on page 112. The problems on this page illustrate measurement; those on page 112 illustrate partition. If the children do not see these problems, use objects, lines and circles on the blackboard, etc., to make the work concrete to the children.

DIVISION FACTS



1. Suppose you wish to divide 6 apples equally among 2 playmates and yourself. Into how many equal groups will you put them?

Each group shown in the accompanying illustration contains *one-third* of the apples. One-third is also written $\frac{1}{3}$.

$\frac{1}{3}$ of 6 apples = ? apples.

2. John's mother divided 6 oranges equally among 3 boys. Each boy had $\frac{1}{3}$ of 6 oranges, or — oranges?

3. A man divided 15 cents equally among his 3 children. He gave each $\frac{1}{3}$ of 15 cents, or how many cents?

4. There are 24 hours in a day. A laborer works $\frac{1}{3}$ of 24 hours each day. How many hours per day does he work?

5. Roger skated 9 miles one day and $\frac{1}{3}$ as far the second day. How many miles did he skate the second day?

6. An express train went 30 miles in an hour, while a local freight went only $\frac{1}{3}$ as many miles in the same time. How many miles did the local freight train travel in the hour?

7. Find the quotients of the following:

$$\frac{1}{3} \text{ of } 9 = ? \quad \frac{1}{3} \text{ of } 21 = ? \quad \frac{1}{3} \text{ of } 18 = ?$$

$$\frac{1}{3} \text{ of } 24 = ? \quad \frac{1}{3} \text{ of } 27 = ? \quad \frac{1}{3} \text{ of } 12 = ?$$

$$\frac{1}{3} \text{ of } 15 = ? \quad \frac{1}{3} \text{ of } 6 = ? \quad \frac{1}{3} \text{ of } 24 = ?$$

$$\frac{1}{3} \text{ of } 18 \text{ children} = ? \text{ children.}$$

$$\frac{1}{3} \text{ of } 12 \text{ oranges} = ? \text{ oranges.}$$

8. Victoria joined a Christmas savings club and saved \$21 in a year. At the end of this time she drew out $\frac{1}{3}$ of her money. She drew out how many dollars?

9. A yard equals how many feet? Mary used $\frac{1}{3}$ of a yard of ribbon. How many feet did she use?

10. Georgia is 9 years old. Her baby brother is $\frac{1}{3}$ as old. How many years old is her brother?

11. Janet had 18 roses. She put $\frac{1}{3}$ of them in a vase. How many did she put in the vase?

12. Supply the missing numbers:

$$\begin{array}{lll} \frac{1}{3} \text{ of ?} = 9 & \frac{1}{3} \text{ of ?} = 10 & \frac{1}{3} \text{ of ?} = 8 \\ \frac{1}{3} \text{ of ?} = 3 & \frac{1}{3} \text{ of ?} = 7 & \frac{1}{3} \text{ of ?} = 4 \\ \frac{1}{3} \text{ of ?} = 6 & \frac{1}{3} \text{ of ?} = 5 & \frac{1}{3} \text{ of ?} = 2 \end{array}$$

13. Copy and write the quotients above the lines:

$$\begin{array}{ccccc} 3 \overline{)27} & 3 \overline{)6} & 3 \overline{)21} & 3 \overline{)12} & 3 \overline{)30} \\ 3 \overline{)15} & 3 \overline{)24} & 3 \overline{)9} & 3 \overline{)3} & 3 \overline{)18} \end{array}$$

14. Supply the missing numbers:

$$\begin{array}{lll} 6 = \frac{1}{3} \text{ of ?} & 3 = \frac{1}{3} \text{ of ?} & 9 = \frac{1}{3} \text{ of ?} \\ 2 = \frac{1}{3} \text{ of ?} & 8 = \frac{1}{3} \text{ of ?} & 5 = \frac{1}{3} \text{ of ?} \\ 7 = \frac{1}{3} \text{ of ?} & 4 = \frac{1}{3} \text{ of ?} & 10 = \frac{1}{3} \text{ of ?} \end{array}$$

15. Two villages are 18 miles apart. Some boys on a hike walked $\frac{1}{3}$ of this distance. How many miles did they walk?

16. Anna is 7 years old, and her age is only $\frac{1}{3}$ of the age of her oldest sister. How old is her oldest sister? 7 years = $\frac{1}{3}$ of ? years.

PRODUCTS CONTAINING THE FACTOR FOUR

Add these columns:

5	8	4	7	9	6	10
5	8	4	7	9	6	10
5	8	4	7	9	6	10
5	8	4	7	9	6	10
<u>5</u>	<u>8</u>	<u>4</u>	<u>7</u>	<u>9</u>	<u>6</u>	<u>10</u>

Find the products of these multiplication facts which you do not know by using addition as shown above and then say them over and over until you remember them:

Four 1's = ?	Four 3's = ?
Four 7's = ?	Four 9's = ?
Four 2's = ?	Four 4's = ?
Four 6's = ?	Four 8's = ?
Four 10's = ?	Four 5's = ?

ORAL PROBLEMS

1. A dime is equal to how many pennies? 4 dimes equal how many pennies?

2. There are 9 players on a baseball team. 4 baseball teams are playing in the city park. How many players do they need for the 4 teams?

3. Harriet bought a half dozen oranges and gave the grocer 4 nickels to pay for them. How many cents did the oranges cost? (4 nickels = how many cents?)

4. A gallon of milk will fill 4 quart bottles. How many quart bottles of milk will a 4-gallon pail full make?

5. How many feet are there in a yard? Emma said her bedroom is 4 yards long. How many feet long is her room?

6. Here is a picture of a castle. The tall round parts are called towers. There are 8 windows in each tower. How many windows are there in the 4 towers?



7. Find the cost of 4 candy bars at 6 cents each.

8. How many days are there in 4 weeks?

9. Multiply:

6	2	10	5	9	1	8	4	7	3
<u>4</u>	<u>4</u>	<u>4</u>	<u>4</u>	<u>4</u>	<u>4</u>	<u>4</u>	<u>4</u>	<u>4</u>	<u>4</u>

10. Give the missing numbers in these multiplication facts:

?	?	?	?	?	?	?	?	?	?
<u>4</u>	<u>4</u>	<u>4</u>	<u>4</u>	<u>4</u>	<u>4</u>	<u>4</u>	<u>4</u>	<u>4</u>	<u>4</u>
28	12	20	36	8	24	40	4	32	16

11. Give the products:

$7 \times 2 = ?$	$2 \times 6 = ?$	$4 \times 9 = ?$	$3 \times 7 = ?$
$4 \times 3 = ?$	$4 \times 8 = ?$	$2 \times 8 = ?$	$3 \times 9 = ?$
$3 \times 9 = ?$	$2 \times 4 = ?$	$3 \times 5 = ?$	$8 \times 2 = ?$
$4 \times 6 = ?$	$4 \times 4 = ?$	$4 \times 7 = ?$	$3 \times 8 = ?$
$2 \times 9 = ?$	$9 \times 2 = ?$	$2 \times 5 = ?$	$4 \times 9 = ?$
$6 \times 3 = ?$	$2 \times 7 = ?$	$4 \times 5 = ?$	$5 \times 3 = ?$

12. Make the following table and fill in the products:

$4 \times 1 = ?$	$4 \times 6 = ?$	$1 \times 4 = ?$	$6 \times 4 = ?$
$4 \times 2 = ?$	$4 \times 7 = ?$	$2 \times 4 = ?$	$7 \times 4 = ?$
$4 \times 3 = ?$	$4 \times 8 = ?$	$3 \times 4 = ?$	$8 \times 4 = ?$
$4 \times 4 = ?$	$4 \times 9 = ?$	$4 \times 4 = ?$	$9 \times 4 = ?$
$4 \times 5 = ?$	$4 \times 10 = ?$	$5 \times 4 = ?$	$10 \times 4 = ?$

MULTIPLICATION FACTS

13. Use addition as on page 109 to show that:

$$5 \times 4 = 4 \times 5$$

$$8 \times 4 = 4 \times 8$$

$$6 \times 4 = 4 \times 6$$

$$9 \times 4 = 4 \times 9$$

$$7 \times 4 = 4 \times 7$$

$$10 \times 4 = 4 \times 10$$

14. Give the products:

4	4	4	4	4	4	4	4
2	9	5	8	10	6	7	3
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>

ORAL PROBLEMS

1. How many wheels are there on an automobile? How many wheels are there on 5 automobiles?

2. Harry helped his Uncle Charles pick apples. They picked 4 bushels from each of 6 small trees. How many bushels did they get from the 6 trees?

3. It takes 4 horseshoes to shoe a horse. How many horseshoes does a farmer need to shoe his 7 work horses?

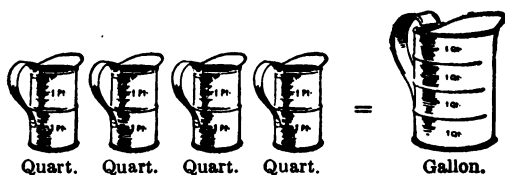
4. There are 8 gallons of milk in a can. How many quart bottles of milk will that amount make?

5. Fred bought a set of dominoes. He turned the box over and emptied them on the table. He arranged them in 7 piles with 4 dominoes in each pile. How many dominoes were there in the whole set?

6. Ida planted 9 rows of tulip bulbs with 4 in each row. How many tulip bulbs did she have in her flower bed?

7. Dorothy had a valentine party. She cut each of the 10 small cakes, which she had bought at the bakery, into 4 pieces. How many pieces of cake did she have to serve?

FOUR AS A DIVISOR



There are — quarts in 1 gallon.

1. 2 four's are ? 8 quarts = — gallons. $8 \div 2 = ?$

Prove this answer and some of the following by measuring sand or water with the quart and gallon measures.

2. 5 fours are ? 20 quarts are — gallons. $20 \div 4 = ?$
3. 3 fours are ? 12 quarts are — gallons. $12 \div 4 = ?$
4. 8 fours are ? 32 quarts are — gallons. $32 \div 4 = ?$
5. 4 fours are ? 16 quarts are — gallons. $16 \div 4 = ?$
6. 6 fours are ? 24 quarts are — gallons. $24 \div 4 = ?$
7. 9 fours are ? 36 quarts are — gallons. $36 \div 4 = ?$
8. 7 fours are ? 28 quarts are — gallons. $28 \div 4 = ?$
9. 10 fours are ? 40 quarts are — gallons. $40 \div 4 = ?$

Four "quarters" = 1 dollar.

1. 40 quarters = — dollars. $40 \div 4 =$
2. 12 quarters = — dollars. $12 \div 4 =$
3. 20 quarters = — dollars. $20 \div 4 =$
4. 28 quarters = — dollars. $28 \div 4 =$
5. 8 quarters = — dollars. $8 \div 4 =$
6. 24 quarters = — dollars. $24 \div 4 =$
7. 32 quarters = — dollars. $32 \div 4 =$
8. 16 quarters = — dollars. $16 \div 4 =$
9. 36 quarters = — dollars. $36 \div 4 =$

FOUR AS A DIVISOR

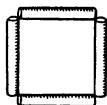


1. Marjorie is making ribbon badges for a club to which she belongs. Each badge requires 4 inches of ribbon. How many can she cut from a yard or 36 inches?

2. 40 children marching 4 abreast make a line how many deep? $40 \div 4 = ?$

3. There are 16 pieces of fudge in a pan. How many children can have 4 pieces each? $16 \div 4 = ?$

4. How many strips 4 inches wide can you cut from a piece of paper 12 inches wide? $12 \div 4 = ?$



5. How many pegs does it take to make this square? How many squares could you make with 20 pegs; with 8; with 24; with 28?

6. If Frank earns 4 dollars a week, in how many weeks will he earn enough to buy a bicycle costing 20 dollars?

7. There are 5 school days in a week. How many weeks does it take to make 40 school days?

8. In a school parade a class of 32 pupils marched 4 abreast. How many rows did the class make?

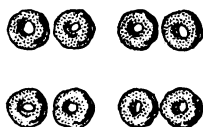
9. Some girls were paid 4 cents a quart for picking raspberries. How many quarts did Mildred pick if she received 36 cents?

10. Write the quotients above the lines:

4) $\overline{16}$ 4) $\overline{32}$ 4) $\overline{8}$ 4) $\overline{20}$ 4) $\overline{12}$ 4) $\overline{36}$ 4) $\overline{32}$

4) $\overline{24}$ 4) $\overline{36}$ 4) $\overline{4}$ 4) $\overline{40}$ 4) $\overline{28}$ 4) $\overline{24}$ 4) $\overline{20}$

1. If you divide 8 doughnuts equally among 4 children, you divide them into how many equal groups? Each group is one-fourth (or $\frac{1}{4}$) of 8, or how many?



2. Helen and two of her chums made 20 May baskets. Helen filled $\frac{1}{4}$ of them with violets. How many did she fill with violets?

Show that $\frac{1}{4}$ of 20 gives the same result as $20 \div 4$.

3. John had 36 tulips in his garden. When they blossomed, he found that $\frac{1}{4}$ of them were red. How many red tulips did he have?

4. In throwing at a mark, Richard hit it $\frac{1}{4}$ of his trials. How many times did he hit the mark in 16 trials?

5. There are 40 drawing pencils in the pencil holder. $\frac{1}{4}$ of them need sharpening. How many pencils need sharpening?

6. There were 32 erasers in the cupboard. Victor put $\frac{1}{4}$ of them in the chalk trays. He put $\frac{1}{4}$ of 32 erasers, or — erasers, in the chalk trays.

7. Tony earned 8 dollars picking strawberries. He spent $\frac{1}{4}$ of this amount for roller skates. How much did he pay for his roller skates?

8. Supply the missing numbers:

$$\frac{1}{4} \text{ of } 4 = ? \qquad \frac{1}{4} \text{ of } 36 = ? \qquad \frac{1}{4} \text{ of } 16 = ?$$

$$\frac{1}{4} \text{ of } 28 = ? \qquad \frac{1}{4} \text{ of } 8 = ? \qquad \frac{1}{4} \text{ of } 32 = ?$$

$$\frac{1}{4} \text{ of } 12 = ? \qquad \frac{1}{4} \text{ of } 24 = ? \qquad \frac{1}{4} \text{ of } 20 = ?$$

$$\frac{1}{4} \text{ of } 12 \text{ oranges} = ? \text{ oranges,}$$

$$\frac{1}{4} \text{ of } 32 \text{ pupils} = ? \text{ pupils.}$$

PRODUCTS CONTAINING THE FACTOR FIVE

7	5	8	6	10	9
7	5	8	6	10	9
7	5	8	6	10	9
7	5	8	6	10	9
7	5	8	6	10	9

Find the products for the new multiplication facts in this exercise by using addition as shown above:

Five 10's = ?	Five 5's = ?
Five 3's = ?	Five 8's = ?
Five 9's = ?	Five 1's = ?
Five 2's = ?	Five 4's = ?
Five 7's = ?	Five 6's = ?

ORAL PROBLEMS

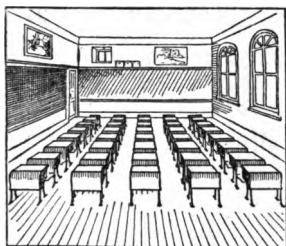
1. If you ask a storekeeper to give you pennies for 5 dimes, how many pennies do you expect to receive?

2. At a candy sale the girls placed 6 pieces of fudge in each sack. A customer bought 5 sacks. How many pieces did he get in the 5 sacks?

3. Ethel's teacher placed a star on each pupil's spelling blank who did not misspell a word during the week. Ethel's father said he would place a penny on the point of each star that she got in two months. She had 5 stars. How many pennies did her father give her?

4. John walks 8 blocks a day going and coming from school. How many blocks does he walk going and coming from school in 5 days?

5. Mary's schoolroom has 5 rows of seats and there are 7 seats in each row. How many seats are there in the room?



6. A school garden has 5 rows of plots and 9 plots in each row. How many plots are there in this school garden?

7. Five 6's = ? Then six 5's = ?

8. Five 9's = ? Then nine 5's = ?

9. Five 7's = ? Give the product of seven 5's.

10. Five 8's = ? What is the product of eight 5's?

11. Show that five 10's = ten 5's.

12. How many pennies can you get in exchange for 6 nickels? For 5 nickels? For 7 nickels?

13. Ruth bought 8 apples for a party at 5 cents each. How much did the apples cost her?

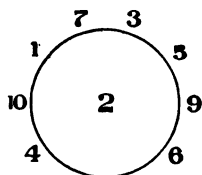
14. Alice put 9 nickels in her savings bank. How many cents did she add to her money in the bank?

15. Henry sold a neighbor 10 quarts of peas for 5 cents a quart. How much did he receive for the peas?

16. Make a multiplication table for the fives as shown below and fill in the products:

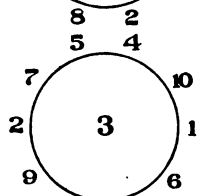
$5 \times 1 = ?$	$5 \times 6 = ?$	$1 \times 5 = ?$	$6 \times 5 = ?$
$5 \times 2 = ?$	$5 \times 7 = ?$	$2 \times 5 = ?$	$7 \times 5 = ?$
$5 \times 3 = ?$	$5 \times 8 = ?$	$3 \times 5 = ?$	$8 \times 5 = ?$
$5 \times 4 = ?$	$5 \times 9 = ?$	$4 \times 5 = ?$	$9 \times 5 = ?$
$5 \times 5 = ?$	$5 \times 10 = ?$	$5 \times 5 = ?$	$10 \times 5 = ?$

ORAL REVIEW DRILL FOR THE MULTIPLICATION FACTS



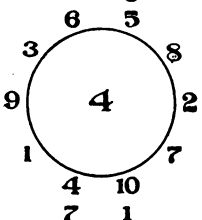
1. Multiply each number on the outside of the first circle by 2, moving to the right.

2. Multiply each number on the outside of the first circle by 2, moving to the left.

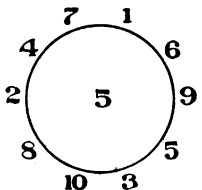


3. Place 2 in the center of each of the other circles and multiply, moving to the right and then to the left.

4. Use 3, 4, and 5 in each of the four circles in the same way.



As the pupils become more proficient, the drill may be varied by *combining addition with multiplication*. For example, if 3 were to be added to each product in the third circle, the teacher would point to the five, the pupils would say 20 and then add 3, saying 23. The drill would then be answered as follows: 20, 23; 32, 35; 8, 11; 28, 31; 40, 43; 16, 19; 4, 7; 36, 39; 12, 15; 24, 27.



When a pupil is multiplying by 2 in a long multiplication problem he never has to "carry" more than 1; when multiplying by 3 he never "carries" more than 2; when multiplying by 4 he never carries more than 3; when multiplying by 5 never more than 4. For this reason numbers higher than 1 need not be added in combination addition and

multiplication drills with 2 as a multiplier. Add 1 or 2 when multiplying by 3; add 1, 2, or 3 when multiplying by 4; add 1, 2, 3, or 4 when multiplying by 5; etc.

RELAY RACE

Have 4 pupils on a team. The first uses 2 as a multiplier for one of the circles. As soon as he finishes, the next pupil begins with 3 as a multiplier. The others use 4 and 5 as multipliers. The team with the shortest time wins the relay race.

FIVE AS A DIVISOR

1. Eight 5's are equal to what number? 40 children marching 5 abreast make how many rows?

2. Ten 5's = ? 50 children marching 5 abreast make how many rows?



3. Eight 5's = ? Donald planted his tomato plants 5 in a row. How many rows did he make if he had 30 plants?

4. A nickel = ? cents. How many nickels in the following:

\$.15 \$.35 \$.25 \$.40 \$.30 \$.45 \$.20

5. Two 5's = ? 10 school days equal how many school weeks of 5 days each?

6. Four 5's = ? 20 school days equal how many school weeks of 5 days each?

7. At 5 cents each, how many apples can be bought for 15 cents; for 30 cents; for 10 cents; for 40 cents?

8. Write the quotients of the following:

$5 \overline{)30}$ $5 \overline{)40}$ $5 \overline{)15}$ $5 \overline{)25}$ $5 \overline{)10}$

$5 \overline{)45}$ $5 \overline{)20}$ $5 \overline{)35}$ $5 \overline{)50}$ $5 \overline{)5}$

9. Supply the missing numbers:

$$? \div 5 = 3$$

$$? \div 5 = 7$$

$$? \div 5 = 5$$

$$? \div 5 = 8$$

$$? \div 5 = 4$$

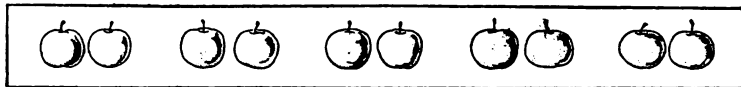
$$? \div 5 = 10$$

$$? \div 5 = 2$$

$$? \div 5 = 9$$

$$? \div 5 = 6$$

DIVISION FACTS



1. Gertrude's mother gave her 10 apples to divide among herself and four playmates. She divided them into 5 equal groups. Each girl had $\frac{1}{5}$ of the whole number. $\frac{1}{5}$ of 10 apples = how many apples?

2. There were 20 people in an elevator. $\frac{1}{5}$ of them got off at the 3rd floor. How many people got off at the 3rd floor?

3. Roy looked over the lead pencils in the teacher's box. $\frac{1}{5}$ of the 35 pencils in the box needed sharpening. How many pencils needed sharpening?

4. William's mother had 25 cents in her purse. She gave him $\frac{1}{5}$ of that amount to buy marbles. How much did he have to spend for marbles?

5. On a rainy day $\frac{1}{5}$ of the 30 pupils in the third grade were absent. How many pupils were absent?

6. Give the results of the following:

$$\frac{1}{5} \text{ of } 10 \text{ marbles} = ?$$

$$\frac{1}{5} \text{ of } 15 \text{ cows} = ?$$

$$\frac{1}{5} \text{ of } 40 \text{ books} = ?$$

$$\frac{1}{5} \text{ of } 45 \text{ children} = ?$$

7. Supply the missing numbers:

$$\frac{1}{5} \text{ of } ? = 6$$

$$\frac{1}{5} \text{ of } ? = 9$$

$$\frac{1}{5} \text{ of } ? = 10$$

$$\frac{1}{5} \text{ of } ? = 3$$

$$\frac{1}{5} \text{ of } ? = 4$$

$$\frac{1}{5} \text{ of } ? = 7$$

$$\frac{1}{5} \text{ of } ? = 8$$

$$\frac{1}{5} \text{ of } ? = 2$$

$$\frac{1}{5} \text{ of } ? = 5$$

$$? \div 5 = 9$$

$$? \div 5 = 8$$

$$? \div 5 = 7$$

$$? \div 5 = 6$$

$$? \div 5 = 5$$

$$? \div 5 = 3$$

PRODUCTS CONTAINING THE FACTOR SIX

Find the products of the new multiplication facts in this list by writing any number *six* times in a column and adding as shown on page 120:

Six 3's = ?

Six 4's = ?

Six 9's = ?

Six 10's = ?

Six 1's = ?

Six 5's = ?

Six 6's = ?

Six 8's = ?

Six 2's = ?

Six 7's = ?

ORAL PROBLEMS

1. Ellen wished to get change for their school entertainment. She knew she could get 10 dimes for a dollar. How many dimes ought she to get for 6 dollars?

2. Our flag has 6 rows of stars with 8 stars in each row. How many stars are there on the flag?

3. Ethel spent 6 weeks visiting her aunt on the farm. How many days did she stay?

4. It takes 9 seconds for Ina to add each addition problem in a certain drill exercise. At that rate how long would it take her to add the whole exercise of 6 problems?

5. If a quart brick of ice cream is cut in 6 pieces, how many persons can be served with 6 quart bricks of ice cream?

6. Mabel bought 6 ice cream cones for an automobile party. How much did the 6 cones cost at 5 cents each?



MULTIPLICATION FACTS

7. Seven 6's = ? Six 7's = ?
8. Nine 6's = ? Six 9's = ?
9. Compare the product of ten 6's with the product of six 10's.
10. Show that eight 6's = six 8's.
11. Grace bought 7 cards of buttons with 6 buttons on each card. How many buttons did she buy?
12. A third grade served cake at its Washington's birthday party. The pupils cut each of the 9 small cakes into 6 pieces. How many pieces did they have to serve?
13. Find the cost of 10 bars of candy at 6 cents each.
14. Edward has 8 rows of cabbages with 6 in each row. How many cabbages has he in the patch?
15. Make a multiplication table for the 6's like the one on page 121, using 6's as the multipliers.

DRILL EXERCISE

Drill on this exercise until the pupils can give the products quickly and accurately:

9	6	5	9	5	7	5	5	8	7	6	9
<u>5</u>	<u>6</u>	<u>7</u>	<u>6</u>	<u>8</u>	<u>6</u>	<u>5</u>	<u>6</u>	<u>6</u>	<u>5</u>	<u>7</u>	<u>6</u>
4	5	9	6	6	3	7	8	8	4	8	4
<u>8</u>	<u>9</u>	<u>4</u>	<u>9</u>	<u>5</u>	<u>9</u>	<u>5</u>	<u>4</u>	<u>5</u>	<u>9</u>	<u>6</u>	<u>8</u>
8	9	6	4	6	7	9	6	5	9	7	4
<u>5</u>	<u>3</u>	<u>6</u>	<u>9</u>	<u>7</u>	<u>4</u>	<u>6</u>	<u>5</u>	<u>9</u>	<u>3</u>	<u>6</u>	<u>9</u>

SIX AS A DIVISOR

1. Six 6's = ? How many pieces 6 inches long can be cut from a yard (36 inches) of ribbon?
2. Nine 6's = ? 54 children marching 6 abreast make a column how many rows deep?
3. Four 6's = ? 24 pounds of sugar will make how many 6-pound packages?
4. Seven 6's = ? At 6 cents a card, one can buy how many cards of buttons for 42 cents?
5. Three 6's = ? 18 chairs arranged 6 in a row make how many rows?
6. Two 6's = ? 12 pansy plants planted 6 in a row make how many rows?
7. Four 6's = ? 24 fruit trees planted 6 in a row make how many rows?
8. The ruler in Joseph's pencil box is only 6 inches long. How many times must he lay it down in measuring a line 12 inches long; in measuring a line 24 inches long; in one 42 inches long; in one 36 inches long; 18 inches long; 30 inches long, and 48 inches long?
9. At a candy sale 6 pieces of candy were sold in a bag for a nickel. How many bags did each of the following kinds of candy fill: butterscotch 36 pieces; chocolate fudge 54 pieces; peanut brittle 60; cocoanut bars 24; taffy 48?
10. Divide:

$$6\overline{)54} \quad 6\overline{)42} \quad 6\overline{)30} \quad 6\overline{)4} \quad 6\overline{)48} \quad 6\overline{)36} \quad 6\overline{)18} \quad 6\overline{)12}$$

DIVISION FACTS

11. $6 \times ? = 30$. Edwin saved 30 cents and then spent $\frac{1}{6}$ of his money for an orange. How much did the orange cost?

12. $6 \times ? = 18$. There were 18 eggs in a basket. The cook used $\frac{1}{6}$ of them for a custard. How many did she use?

13. Russell's father gave him 36 little chickens for a birthday present. He succeeded in raising all except $\frac{1}{6}$ of them. How many did he lose?

14. There are 42 children in one room at the Lincoln School. One stormy day $\frac{1}{6}$ of them were absent. How many were absent?

15. Grace found a hen's nest in her uncle's barn. They candled the eggs and found that $\frac{1}{6}$ of the 12 eggs were not good. How many were not good?

16. Arthur had \$24 in the savings bank. He drew out $\frac{1}{6}$ of his money with which to buy Christmas presents. How many dollars did he draw out of his account?

17. Supply the missing numbers:

$\frac{1}{6}$ of 18 = ?	$\frac{1}{6}$ of 42 = ?	$\frac{1}{6}$ of 30 = ?
$\frac{1}{6}$ of 24 = ?	$\frac{1}{6}$ of 54 = ?	$\frac{1}{6}$ of 48 = ?
$\frac{1}{6}$ of 60 = ?	$\frac{1}{6}$ of 12 = ?	$\frac{1}{6}$ of 36 = ?
$\frac{1}{6}$ of ? = 9	$\frac{1}{6}$ of ? = 2	$\frac{1}{6}$ of ? = 4
$\frac{1}{6}$ of ? = 5	$\frac{1}{6}$ of ? = 6	$\frac{1}{6}$ of ? = 8
$\frac{1}{6}$ of ? = 7	$\frac{1}{6}$ of ? = 10	$\frac{1}{6}$ of ? = 3
$36 \div 6 = ?$	$48 \div 6 = ?$	$54 \div 6 = ?$
$18 \div 6 = ?$	$24 \div 6 = ?$	$42 \div 6 = ?$
$30 \div 6 = ?$	$60 \div 6 = ?$	$6 \div 6 = ?$

PRODUCTS CONTAINING THE FACTOR SEVEN

You have already had all the multiplication facts in the following list except seven 7's, seven 8's, seven 9's, and seven 10's. Use addition to find these new products:

$$\text{Seven } 8\text{'s} = ?$$

$$\text{Seven } 5\text{'s} = ?$$

$$\text{Seven } 2\text{'s} = ?$$

$$\text{Seven } 9\text{'s} = ?$$

$$\text{Seven } 6\text{'s} = ?$$

$$\text{Seven } 1\text{'s} = ?$$

$$\text{Seven } 4\text{'s} = ?$$

$$\text{Seven } 3\text{'s} = ?$$

$$\text{Seven } 10\text{'s} = ?$$

$$\text{Seven } 7\text{'s} = ?$$

ORAL PROBLEMS

1. Ellen bought 7 cards of buttons at 10 cents a card. How much did she pay for the 7 cards?
2. Catherine sold a grocer 7 cabbages at 8 cents each. How much did she receive for them?
3. The grocer sold the cabbages at an average profit of 7 cents each. How much did he gain on the 7 cabbages?
4. How many days are there in 7 weeks?
5. A building 7 stories high has 9 offices on each floor. How many offices are there in the building?
6. Seven 8's = ? Then eight 7's = ?
7. John held a flash card before his class for a few seconds. The pupils saw that there were 8 rows of dots with 7 dots in each row. Give the number of dots on the card.
8. Seven 9's = ? Then nine 7's = ?
9. Edna bought 9 small grapefruit at 7 cents each. How much did she pay for them?

WRITTEN PRACTICE WITH THE 7'S

1. Multiply:

$7 \times 7 = ?$	$7 \times 2 = ?$	$7 \times 7 = ?$	$7 \times 1 = ?$
$2 \times 7 = ?$	$8 \times 7 = ?$	$3 \times 7 = ?$	$5 \times 7 = ?$
$7 \times 4 = ?$	$6 \times 7 = ?$	$7 \times 9 = ?$	$7 \times 6 = ?$
$9 \times 7 = ?$	$10 \times 7 = ?$	$7 \times 5 = ?$	$4 \times 7 = ?$
$7 \times 3 = ?$	$7 \times 9 = ?$	$1 \times 7 = ?$	$7 \times 8 = ?$

2. Supply the missing numbers:

$\begin{array}{r} ? \\ 7 \\ \hline 35 \end{array}$	$\begin{array}{r} 10 \\ ? \\ \hline 70 \end{array}$	$\begin{array}{r} 4 \\ 7 \\ \hline ? \end{array}$	$\begin{array}{r} ? \\ 7 \\ \hline 49 \end{array}$	$\begin{array}{r} 3 \\ ? \\ \hline 21 \end{array}$	$\begin{array}{r} 7 \\ 8 \\ \hline ? \end{array}$	$\begin{array}{r} ? \\ 7 \\ \hline 42 \end{array}$	$\begin{array}{r} 7 \\ ? \\ \hline 63 \end{array}$	$\begin{array}{r} 2 \\ 7 \\ \hline ? \end{array}$
$\begin{array}{r} 7 \\ 3 \\ \hline ? \end{array}$	$\begin{array}{r} ? \\ 6 \\ \hline 42 \end{array}$	$\begin{array}{r} 7 \\ ? \\ \hline 35 \end{array}$	$\begin{array}{r} 7 \\ 9 \\ \hline ? \end{array}$	$\begin{array}{r} ? \\ 4 \\ \hline 28 \end{array}$	$\begin{array}{r} 7 \\ 7 \\ \hline ? \end{array}$	$\begin{array}{r} 7 \\ ? \\ \hline 14 \end{array}$	$\begin{array}{r} ? \\ 7 \\ \hline 56 \end{array}$	$\begin{array}{r} 7 \\ ? \\ \hline 70 \end{array}$

3. Copy and write the products:

$\begin{array}{r} 8 \\ 7 \\ \hline \end{array}$	$\begin{array}{r} 7 \\ 2 \\ \hline \end{array}$	$\begin{array}{r} 3 \\ 7 \\ \hline \end{array}$	$\begin{array}{r} 7 \\ 6 \\ \hline \end{array}$	$\begin{array}{r} 5 \\ 7 \\ \hline \end{array}$	$\begin{array}{r} 7 \\ 9 \\ \hline \end{array}$	$\begin{array}{r} 10 \\ 7 \\ \hline \end{array}$	$\begin{array}{r} 7 \\ 4 \\ \hline \end{array}$	$\begin{array}{r} 1 \\ 7 \\ \hline \end{array}$	$\begin{array}{r} 7 \\ 5 \\ \hline \end{array}$
$\begin{array}{r} 4 \\ 7 \\ \hline \end{array}$	$\begin{array}{r} 7 \\ 7 \\ \hline \end{array}$	$\begin{array}{r} 9 \\ 7 \\ \hline \end{array}$	$\begin{array}{r} 7 \\ 10 \\ \hline \end{array}$	$\begin{array}{r} 6 \\ 7 \\ \hline \end{array}$	$\begin{array}{r} 7 \\ 3 \\ \hline \end{array}$	$\begin{array}{r} 2 \\ 7 \\ \hline \end{array}$	$\begin{array}{r} 7 \\ 1 \\ \hline \end{array}$	$\begin{array}{r} 7 \\ 7 \\ \hline \end{array}$	$\begin{array}{r} 7 \\ 8 \\ \hline \end{array}$

4. Supply the missing numbers:

$? \times 9 = 63$	$7 \times 7 = ?$	$9 \times 7 = ?$
$7 \times ? = 28$	$3 \times ? = 21$	$4 \times ? = 28$
$8 \times 7 = ?$	$? \times 8 = 56$	$6 \times 7 = ?$
$7 \times ? = 42$	$7 \times 5 = ?$	$7 \times 3 = ?$

5. Make a multiplication table for the 7's like the one on page 121, using 7's as the multipliers.

SEVEN AS A DIVISOR

1. Eight 7's = ? 56 chairs, arranged 7 in a row, make how many rows? $56 \div 7 = ?$

2. Nine 7's = ? Joe used 63 blocks in building a platform 7 blocks wide. His platform is how many blocks long? $63 \div 7 = ?$

3. A certain Christmas card with the envelope and stamp costs 7 cents. How many can be bought for 21 cents; for 42 cents?

4. Martha, putting away jelly in the fruit closet, found that the shelves were long enough for just 7 glasses. How many rows would 14 glasses make?

5. One day $\frac{1}{7}$ of the 28 children in a grade were absent. How many were not at school?

6. Rose counted 35 school days before Christmas vacation. When $\frac{1}{7}$ of this time had passed, how many days had gone by?

7. A party which had started on a 70-mile auto trip was obliged to stop because of a puncture after going $\frac{1}{7}$ of the distance. How far had they gone?

8. Give the quotients:

$7\overline{)21}$ $7\overline{)56}$ $7\overline{)14}$ $7\overline{)63}$ $7\overline{)35}$ $7\overline{)42}$ $7\overline{)28}$

$\frac{1}{7}$ of 35 = ? $\frac{1}{7}$ of 42 = ? $49 \div 7 = ?$

$\frac{1}{7}$ of 21 = ? $\frac{1}{7}$ of 63 = ? $56 \div 7 = ?$

$\frac{1}{7}$ of 56 = ? $\frac{1}{7}$ of 28 = ? $63 \div 7 = ?$

$\frac{1}{7}$ of 49 = ? $\frac{1}{7}$ of 14 = ? $42 \div 7 = ?$

9. In a common year February has 28 days. How many weeks are there in February in a common year?

PRODUCTS CONTAINING THE FACTOR EIGHT

You have already learned all the products in this list of multiplication facts except eight 8's, nine 8's, and ten 8's. Review the old facts and learn the new products by using addition:

Eight 5's = ?

Eight 2's = ?

Eight 4's = ?

Eight 10's = ?

Eight 9's = ?

Eight 7's = ?

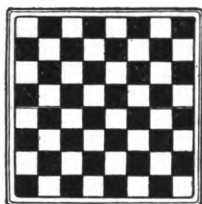
Eight 3's = ?

Eight 1's = ?

Eight 6's = ?

Eight 8's = ?

ORAL PROBLEMS



1. Russell made a checkerboard by painting black and white squares on a large board. There are 8 rows of squares with 8 squares in each row. How many squares did he have to paint on the whole board?

2. Alice priced the grapefruit at the fruit store. Small ones were 8 cents each and larger ones were 10 cents each. She bought 8 of the larger ones. She gave the clerk a dollar. Count out her change.

3. Gerald had a muskmelon patch on his father's farm. He planted 8 rows with 9 hills in each row. How many hills did he have?

4. Eight 9's = ? Then nine 8's = ?

5. Nine basket ball teams entered a basket ball tournament. Each team was allowed to enter 8 boys. How many boys were entered in the tournament?

6. Find the cost of 10 bars of candy at 8 cents each.

7. What is the cost of 8 postage stamps at 2 cents each?

8. Earle gave a druggist a dollar bill to pay for a 60 cent purchase. The druggist gave him 8 nickels in change. The 8 nickels are equal to how many cents?

9. A gallon is equal to how many quarts? 8 gallons of milk will make how many quarts of milk?

10. What is the cost of 8 apples at 3 cents each?

11. Make a multiplication table for the 8's. (See page 121.)

12. Give the missing numbers in these multiplication facts:

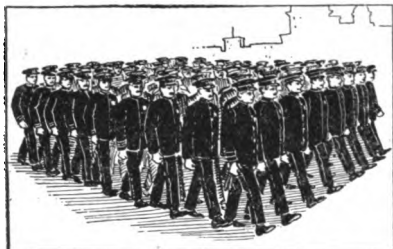
8	?	9	8	8	5	?	2	8	8
8	8	8	?	?	8	8	?	?	2
<u>?</u>	<u>24</u>	<u>?</u>	<u>24</u>	<u>72</u>	<u>?</u>	<u>56</u>	<u>16</u>	<u>40</u>	<u>?</u>
?	8	4	8	?	8	10	8	4	8
<u>8</u>	<u>?</u>	<u>8</u>	<u>7</u>	<u>8</u>	<u>?</u>	<u>?</u>	<u>?</u>	<u>8</u>	<u>?</u>
48	72	?	?	64	32	80	48	?	56

DRILL EXERCISE

Give the products:

7	9	8	9	7	8	6	9	7	5	3	9
<u>9</u>	<u>6</u>	<u>9</u>	<u>4</u>	<u>8</u>	<u>6</u>	<u>9</u>	<u>3</u>	<u>4</u>	<u>7</u>	<u>8</u>	<u>7</u>
9	3	8	9	4	5	3	7	6	6	8	4
<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>4</u>	<u>9</u>	<u>6</u>	<u>8</u>	<u>3</u>	<u>8</u>	<u>7</u>
5	6	8	4	8	6	7	9	5	6	8	7
<u>8</u>	<u>6</u>	<u>2</u>	<u>8</u>	<u>3</u>	<u>7</u>	<u>4</u>	<u>3</u>	<u>7</u>	<u>9</u>	<u>6</u>	<u>8</u>

EIGHT AS A DIVISOR



1. If a squad of 72 policemen form in a column 8 abreast, how many rows of 8 are there in the squad?

2. There are 8 pints in a gallon. How many gallons are there

in 24 pints? How many gallons are there in 32 pints?

3. In order to seat 48 children 8 in a row, how many rows will be needed?

4. There are 8 quarts in a peck. How many pecks are there in 64 quarts? How many pecks are there in 40 quarts?

5. Small grapefruit are priced at one fruit store at 8 cents each. How many can be bought for 40 cents? How many for 56 cents?

6. Ethel paid 40 cents for 8 oranges. Each orange cost $\frac{1}{8}$ of 40 cents, or how many cents?

7. A party of 8 girls went nutting. They had a bushel basket full of nuts. They knew that there are 32 quarts in a bushel. Each girl measured out $\frac{1}{8}$ of the 32 quarts with a quart measuring cup. How many quarts did each one get?

8. A quart brick of ice cream may be cut into 8 thin slices. How many quarts of cream will be needed to serve a party of 32 children?

9. Mary's mother gave her 16 cookies to divide among seven playmates and herself. Each received $\frac{1}{8}$ of 16 cookies, or — cookies.

10. How many pint bottles will a gallon of milk fill? (See problem 2.) How many gallons of milk are needed to fill 24 pint bottles?

11. Give the quotients:

$$8)\overline{40} \quad 8)\overline{32} \quad 8)\overline{16} \quad 8)\overline{48} \quad 8)\overline{24} \quad 8)\overline{56}$$

$$8)\overline{72} \quad 8)\overline{80} \quad 8)\overline{64} \quad 8)\overline{8} \quad 8)\overline{56} \quad 8)\overline{72}$$

12. Supply the missing numbers:

$$\frac{1}{8} \text{ of } ? = 4$$

$$\frac{1}{8} \text{ of } ? = 5$$

$$\frac{1}{8} \text{ of } ? = 6$$

$$\frac{1}{8} \text{ of } ? = 9$$

$$\frac{1}{8} \text{ of } ? = 8$$

$$\frac{1}{8} \text{ of } ? = 10$$

$$\frac{1}{8} \text{ of } ? = 3$$

$$\frac{1}{8} \text{ of } ? = 2$$

$$\frac{1}{8} \text{ of } ? = 7$$

DRILL EXERCISE

Practice on these division facts until you can say each line of this exercise in at least 15 seconds:

$$8)\overline{48} \quad 3)\overline{0} \quad 5)\overline{45} \quad 6)\overline{18} \quad 2)\overline{4} \quad 4)\overline{36} \quad 7)\overline{21}$$

$$3)\overline{6} \quad 5)\overline{35} \quad 8)\overline{64} \quad 4)\overline{12} \quad 7)\overline{63} \quad 6)\overline{0} \quad 2)\overline{12}$$

$$5)\overline{40} \quad 2)\overline{0} \quad 6)\overline{24} \quad 7)\overline{42} \quad 8)\overline{48} \quad 3)\overline{21} \quad 4)\overline{20}$$

$$4)\overline{0} \quad 8)\overline{32} \quad 2)\overline{2} \quad 3)\overline{18} \quad 5)\overline{45} \quad 7)\overline{28} \quad 6)\overline{54}$$

$$6)\overline{42} \quad 4)\overline{20} \quad 3)\overline{24} \quad 8)\overline{72} \quad 2)\overline{10} \quad 5)\overline{35} \quad 7)\overline{0}$$

$$2)\overline{8} \quad 3)\overline{12} \quad 8)\overline{56} \quad 4)\overline{36} \quad 5)\overline{0} \quad 6)\overline{6} \quad 7)\overline{63}$$

$$7)\overline{49} \quad 4)\overline{24} \quad 3)\overline{15} \quad 5)\overline{30} \quad 6)\overline{54} \quad 2)\overline{6} \quad 8)\overline{0}$$

$$8)\overline{72} \quad 5)\overline{20} \quad 3)\overline{27} \quad 4)\overline{8} \quad 2)\overline{14} \quad 7)\overline{21} \quad 6)\overline{18}$$

$$5)\overline{30} \quad 8)\overline{56} \quad 2)\overline{18} \quad 7)\overline{42} \quad 3)\overline{9} \quad 4)\overline{4} \quad 6)\overline{30}$$

PRODUCTS CONTAINING THE FACTOR NINE

9 10 How many are nine 9's? Find the result
 9 10 by adding the first column at the left. How
 9 10 many are nine 10's? Then how many are
 9 10 ten 9's?

9 10

Give the following products:

9 10

Nine 3's = ?

Nine 2's = ?

9 10

Nine 7's = ?

Nine 10's = ?

9 10

Nine 1's = ?

Nine 6's = ?

— —

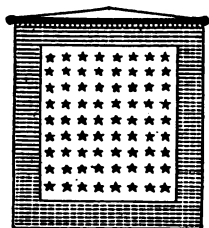
Nine 4's = ?

Nine 5's = ?

Nine 9's = ?

Nine 8's = ?

ORAL PROBLEMS



Service Flag

1. A high school had a service flag containing 8 rows of 9 stars in each row. How many stars were there on this service flag?

2. Eight basket ball teams entered a basket ball tournament. Each team entered 9 boys. How many boys were entered in the tournament?

3. Virginia has a dime savings bank. She has 9 dimes in her bank. How many cents could she get in exchange for the 9 dimes?

4. On the platform of a grade assembly room there are 9 piles of song books with 9 in each pile. How many song books are there in the 9 piles?

5. A high-school company was composed of 9 squads of boys with 8 in each squad. How many boys were there in the company?

WRITTEN PRACTICE WITH THE 9'S

Copy and multiply:

6	3	5	9	2	8	4	7	10	9
9	9	9	9	9	9	9	9	9	9
—	—	—	—	—	—	—	—	—	—
9	9	9	9	9	9	9	9	9	9
7	5	8	3	4	9	6	8	9	10
—	—	—	—	—	—	—	—	—	—

REVIEW EXERCISE

$9 \times 5 = ?$	$3 \times 9 = ?$	$5 \times 7 = ?$	$7 \times 9 = ?$
$9 \times 8 = ?$	$4 \times 8 = ?$	$6 \times 7 = ?$	$8 \times 7 = ?$
$5 \times 7 = ?$	$9 \times 9 = ?$	$3 \times 7 = ?$	$4 \times 9 = ?$
$6 \times 4 = ?$	$7 \times 8 = ?$	$9 \times 6 = ?$	$6 \times 6 = ?$
$7 \times 7 = ?$	$6 \times 9 = ?$	$8 \times 8 = ?$	$4 \times 7 = ?$
$8 \times 4 = ?$	$8 \times 6 = ?$	$5 \times 8 = ?$	$9 \times 10 = ?$

MULTIPLICATION DRILL CARD

7	3	9	4	8	2	9	5	6
---	---	---	---	---	---	---	---	---

Cut a strip of cardboard 6 inches long and $\frac{1}{2}$ inch wide. Arrange the numbers as shown in the illustration. This card may be used for either oral or written drill. In using the card for a written drill, lay it on a sheet of paper and write the answers below the drill card. Multiply each number by 6, then by 7, by 8, and by 9. These multipliers cause pupils the most difficulty and should receive special attention. Also use flash cards and the circular forms on page 122 for additional drill, placing 6, 7, 8, or 9 in the center of each circle. This gives variety to the drill work and prevents it from becoming tiresome.

NINE AS A DIVISOR

1. Eight 9's = ? How many ribbon badges 9 inches long can be cut from 2 yards or 72 inches of ribbon?

2. Eighteen boys are enough for how many baseball "nines"? $18 \div 9 = ?$

3. In crowded city schools there are often 54 children in a room. When they are seated 9 in a row, there are how many rows of desks needed?

4. Five 9's = ? 45 cherry trees planted 9 in a row make how many rows?

5. There are 36 pupils in a third grade of a certain school. Once a week they go to the large assembly room where one section has 9 seats in a row. How many rows will this third grade fill?

6. 54 boys are chosen by the coach for indoor baseball teams. How many "nines" can he make out of that number of boys?

7. On a special sale buttons sold at 9 cents a card. How many cards could be bought for 45 cents?

8. Harry bought 36 cabbage plants at a greenhouse. He decided to set them in rows of 9 each. How many rows did he have?

9. How many yards of ribbon at 9 cents a yard can be bought for 54 cents?

10. Give the quotients of the following:

$$9 \overline{)72} \quad 9 \overline{)36} \quad 9 \overline{)18} \quad 9 \overline{)54} \quad 9 \overline{)27} \quad 9 \overline{)45}$$

$$9 \overline{)63} \quad 9 \overline{)54} \quad 9 \overline{)81} \quad 9 \overline{)72} \quad 9 \overline{)36} \quad 9 \overline{)81}$$

11. Supply the missing numbers:

$\frac{1}{9}$ of 45 = ?	$\frac{1}{9}$ of 54 = ?	$\frac{1}{9}$ of 90 = ?
$\frac{1}{9}$ of 81 = ?	$\frac{1}{9}$ of 27 = ?	$\frac{1}{9}$ of 63 = ?
$\frac{1}{9}$ of 36 = ?	$\frac{1}{9}$ of 18 = ?	$\frac{1}{9}$ of 81 = ?
$\frac{1}{9}$ of ? = 6	$\frac{1}{9}$ of ? = 5	$\frac{1}{9}$ of ? = 8
$\frac{1}{9}$ of ? = 7	$\frac{1}{9}$ of ? = 9	$\frac{1}{9}$ of ? = 10
$\frac{1}{9}$ of ? = 2	$\frac{1}{9}$ of ? = 3	$\frac{1}{9}$ of ? = 1

DRILL EXERCISE

Practice on giving the quotients in this exercise until you can say each line in at least 15 seconds:

2) $\overline{16}$	8) $\overline{24}$	9) $\overline{0}$	3) $\overline{6}$	4) $\overline{24}$	9) $\overline{81}$	4) $\overline{28}$
9) $\overline{54}$	8) $\overline{32}$	7) $\overline{28}$	9) $\overline{9}$	5) $\overline{15}$	6) $\overline{42}$	9) $\overline{72}$
4) $\overline{36}$	9) $\overline{63}$	3) $\overline{15}$	7) $\overline{7}$	6) $\overline{30}$	9) $\overline{36}$	5) $\overline{20}$
5) $\overline{45}$	9) $\overline{45}$	5) $\overline{0}$	8) $\overline{24}$	9) $\overline{63}$	3) $\overline{27}$	7) $\overline{63}$
3) $\overline{24}$	8) $\overline{32}$	4) $\overline{12}$	8) $\overline{64}$	9) $\overline{18}$	4) $\overline{32}$	9) $\overline{36}$
9) $\overline{72}$	6) $\overline{48}$	2) $\overline{18}$	7) $\overline{56}$	3) $\overline{24}$	6) $\overline{24}$	9) $\overline{54}$
5) $\overline{35}$	9) $\overline{72}$	8) $\overline{40}$	3) $\overline{21}$	7) $\overline{35}$	9) $\overline{81}$	6) $\overline{54}$
9) $\overline{36}$	6) $\overline{12}$	8) $\overline{64}$	9) $\overline{45}$	4) $\overline{28}$	5) $\overline{40}$	9) $\overline{45}$
7) $\overline{56}$	3) $\overline{18}$	8) $\overline{24}$	6) $\overline{48}$	8) $\overline{8}$	9) $\overline{63}$	8) $\overline{40}$
7) $\overline{49}$	9) $\overline{18}$	8) $\overline{16}$	9) $\overline{81}$	5) $\overline{40}$	6) $\overline{48}$	9) $\overline{54}$
3) $\overline{3}$	6) $\overline{36}$	8) $\overline{48}$	7) $\overline{56}$	2) $\overline{14}$	4) $\overline{32}$	5) $\overline{10}$
4) $\overline{16}$	7) $\overline{14}$	2) $\overline{16}$	5) $\overline{5}$	8) $\overline{72}$	3) $\overline{27}$	6) $\overline{36}$
6) $\overline{54}$	4) $\overline{28}$	3) $\overline{3}$	8) $\overline{56}$	7) $\overline{35}$	2) $\overline{18}$	5) $\overline{25}$

MULTIPLICATION GAME

	1	2	3	4	5	6	7	8	9	10
1										
2										
3										
4										
5										
6										
7								56		
8							56			
9										
10										

Draw a form similar to that shown in the book. Number the vertical (up and down) columns along the top from left to right and the horizontal (left to right) columns along the left side from top to bottom.

As the teacher reads the products of the multiplication table in a miscellaneous arrangement, as 56, 24, 32, 4, 81, etc., the pupil is to enter each number in its proper place in the table. For example: if the teacher says 56, the pupil thinks 7×8 . He goes to the 7 column at the side and moves to the right until he comes to the space in the 8 vertical column and writes 56 in that space as shown in the illustration. He must also write it in the 7 space of the 8 column.

The teacher should dictate a number and wait until about half of the class have had time to write it. Then give the next number. The one having the most spaces correctly filled wins the game.

This may be varied by the teacher giving the factors as 6×4 and the pupil filling the correct product in the proper place in the table.

1. If you put 12 eggs in a paper bag for a customer by taking 2 eggs in your hand each time, how many times will you need to take 2 eggs to make the dozen?

2. At 8 cents each, how much will 6 pears cost?

3. How many bars of soap at 7 cents each can be bought for 35 cents?

4. Find the cost of 9 packages of garden seeds at 5 cents a package.

5. Elmer makes 9 cents a day delivering milk for his mother. How much does he make per week (7 days)?

6. Ben made 10 cents an hour working for a neighbor. How much did he receive for 6 hours' work?

7. At 5 cents each, how many oranges can be bought for 25 cents? For 45 cents? For 50 cents?

8. What will $\frac{1}{2}$ of a yard of ribbon cost at 18 cents a yard?

9. A yard = ? feet. How many yards are there in 18 feet? In 12 feet? In 24 feet?

10. A restaurant used the following amounts of sugar: Sunday 7 pounds; Monday 5 pounds; Tuesday 7 pounds; Wednesday 5 pounds; Thursday 5 pounds; Friday 5 pounds, and Saturday 8 pounds. Find the *average* amount used each day.

The *average* is found by dividing the total number of pounds by the number of days. $42 \text{ pounds} \div 7 = ? \text{ pounds}$ (the average per day).

11. Find the average cost of 4 chairs at the following prices: \$12; \$7; \$10; \$15.

Divide the total cost by the number of chairs to find the *average* cost.

12. Find the cost of 10 apples at 4 cents each.

13. Ralph watched a clerk weigh some apples which he bought. They weighed 8 pounds. How much did they cost at 8 cents a pound?

14. He asked the clerk to weigh one of the apples. It weighed 4 ounces. How many apples of this size does it take to weigh a pound or 16 ounces?

15. How much will $\frac{1}{4}$ pound of candy cost at 40 cents a pound? How much will $\frac{1}{2}$ pound of nuts cost at 20 cents a pound?

16. Play that you are the clerk in the postoffice. How much would you charge a customer for 7 two-cent stamps? How much for 4 three-cent stamps?

17. There are 36 children at a party. There are 6 quart bricks of ice cream to be served to this number. Into how many pieces would you cut each quart-brick?

18. Marion asked the teacher how many words she missed on the spelling test. The teacher replied, "You missed $\frac{1}{10}$ of the 50 words in the test." How many did she miss?

19. Ethel bought 4 yards of ribbon for her mother at 10 cents a yard. How much did the ribbon cost? What change should she have received if she gave the clerk a half dollar?

20. After delivering milk to his customers, a milkman found that he had 24 quart bottles left. How many gallons did he have left?

21. How many boys does it take to make 2 baseball "nines"? How many for a league of 4 baseball nines?

22. Find the cost of $\frac{1}{3}$ dozen oranges at 5 cents apiece.

23. How many rows, marching 4 in each row, can be formed from a grade containing 32 children? How many rows from a grade of 40 children?

24. A quart equals how many pints? How many pint bottles of milk can be filled with the milk that is used to fill 7 quart bottles? 12 pint bottles equal how many quart bottles?

25. Alice feeds her chickens 8 cents worth of scratch feed every day. How much does the scratch feed cost per week?

26. A bushel equals 32 quarts. Arthur bought a peck or $\frac{1}{4}$ bushel of onion sets to plant in his garden. How many quarts of onion sets did he buy?

27. The "Captain" paid the street car fare of 7 cents each for his baseball nine. How much did he pay for the 9 players?

28. Two girls ran a lemonade stand on their front lawn. They sold 9 large glasses for 10 cents each and 7 small glasses at 5 cents each. How much did they receive in all?

29. Edward is 9 years old today. His teacher told him to multiply his age by 3 and subtract 2 years and then he could tell how old she was. Can you tell the teacher's age?

30. Find the cost of 9 grapefruit at 8 cents each.

31. There are 4 weeks in a school month. How many weeks are there in 10 school months? There are 52 weeks in a year. How many weeks are left for vacation?

32. If Harry earns 2 dimes a day delivering papers, in how many days will he earn 14 dimes?

MULTIPLICATION SPEED EXERCISES

Practice on the following drills until the pupils can give the results rapidly. The drills may be put on the board¹ and the pupils give the products in concert as the teacher points to each combination. Different pupils may then be asked to give a line or a whole exercise. After drilling until the exercises are fairly well mastered, the work may be put on a speed basis. The following time limits are suggested for each exercise for third-grade oral work. Allow about $1\frac{1}{2}$ times as long for written work.

Excellent 45 seconds; *Good* 60 seconds; *Fair* 75 seconds.

DRILL I

7	3	3	2	9	9	3	7	6	2	9
9	3	6	2	6	1	8	5	9	0	5
5	9	7	7	2	8	0	6	2	4	7
1	7	7	6	4	9	6	8	9	9	2
5	0	7	5	8	6	8	0	4	7	9
8	4	8	6	2	4	7	3	8	3	9

DRILL II

5	8	0	8	3	8	4	6	9	9	8
2	8	7	3	7	6	2	7	0	4	5
6	9	3	6	0	7	2	5	4	1	4
6	3	5	3	1	4	8	9	6	1	7
5	8	5	9	1	7	4	5	8	9	1
5	4	2	8	3	9	4	4	0	6	2

¹The drills may also be printed on large sheets of manila cardboard and be available for daily drill. This method will economize blackboard space and also the time of the teacher.

DRILL III

<u>3</u>	<u>3</u>	<u>6</u>	<u>4</u>	<u>5</u>	<u>3</u>	<u>9</u>	<u>2</u>	<u>3</u>	<u>3</u>	<u>8</u>
<u>9</u>	<u>4</u>	<u>9</u>	<u>5</u>	<u>7</u>	<u>0</u>	<u>7</u>	<u>6</u>	<u>6</u>	<u>2</u>	<u>9</u>
<u>6</u>	<u>3</u>	<u>6</u>	<u>4</u>	<u>6</u>	<u>9</u>	<u>1</u>	<u>7</u>	<u>9</u>	<u>7</u>	<u>2</u>
<u>0</u>	<u>8</u>	<u>5</u>	<u>9</u>	<u>2</u>	<u>5</u>	<u>7</u>	<u>8</u>	<u>2</u>	<u>6</u>	<u>3</u>
<u>8</u>	<u>7</u>	<u>6</u>	<u>5</u>	<u>9</u>	<u>4</u>	<u>5</u>	<u>0</u>	<u>8</u>	<u>2</u>	<u>8</u>
<u>7</u>	<u>0</u>	<u>8</u>	<u>3</u>	<u>9</u>	<u>3</u>	<u>8</u>	<u>2</u>	<u>8</u>	<u>7</u>	<u>2</u>

DRILL IV

<u>2</u>	<u>8</u>	<u>5</u>	<u>4</u>	<u>4</u>	<u>9</u>	<u>5</u>	<u>8</u>	<u>1</u>	<u>9</u>	<u>2</u>
<u>7</u>	<u>6</u>	<u>0</u>	<u>8</u>	<u>3</u>	<u>4</u>	<u>3</u>	<u>3</u>	<u>8</u>	<u>3</u>	<u>3</u>
<u>6</u>	<u>9</u>	<u>7</u>	<u>7</u>	<u>6</u>	<u>6</u>	<u>6</u>	<u>6</u>	<u>5</u>	<u>4</u>	<u>8</u>
<u>7</u>	<u>2</u>	<u>4</u>	<u>1</u>	<u>6</u>	<u>2</u>	<u>3</u>	<u>5</u>	<u>9</u>	<u>0</u>	<u>4</u>
<u>3</u>	<u>4</u>	<u>2</u>	<u>5</u>	<u>8</u>	<u>9</u>	<u>4</u>	<u>3</u>	<u>3</u>	<u>5</u>	<u>0</u>
<u>2</u>	<u>7</u>	<u>6</u>	<u>7</u>	<u>1</u>	<u>8</u>	<u>5</u>	<u>9</u>	<u>4</u>	<u>4</u>	<u>5</u>

DRILL V

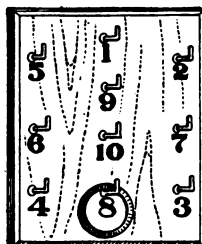
<u>5</u>	<u>8</u>	<u>3</u>	<u>4</u>	<u>9</u>	<u>1</u>	<u>5</u>	<u>2</u>	<u>4</u>	<u>5</u>	<u>3</u>
<u>4</u>	<u>0</u>	<u>9</u>	<u>4</u>	<u>8</u>	<u>0</u>	<u>7</u>	<u>5</u>	<u>7</u>	<u>5</u>	<u>6</u>
<u>0</u>	<u>7</u>	<u>4</u>	<u>3</u>	<u>2</u>	<u>9</u>	<u>3</u>	<u>9</u>	<u>3</u>	<u>9</u>	<u>8</u>
<u>9</u>	<u>4</u>	<u>6</u>	<u>8</u>	<u>8</u>	<u>3</u>	<u>1</u>	<u>5</u>	<u>5</u>	<u>4</u>	<u>5</u>
<u>7</u>	<u>0</u>	<u>8</u>	<u>4</u>	<u>6</u>	<u>3</u>	<u>8</u>	<u>1</u>	<u>5</u>	<u>5</u>	<u>9</u>
<u>6</u>	<u>8</u>	<u>6</u>	<u>2</u>	<u>8</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>8</u>	<u>2</u>	<u>9</u>

Playing Bounce. Have the pupils form a circle. The teacher stands in the center with a tennis ball and says 9×7 and bounces the ball toward a pupil as 7 is announced. The pupil catching the ball must reply immediately or take his seat. Give the multiplication facts in a miscellaneous order.

DRILL VI

7	8	4	8	6	4	5	7	1	8	7
3	2	1	7	4	8	6	8	4	3	2
4	2	6	2	8	2	6	7	9	6	6
9	9	7	1	9	4	6	7	7	1	3
2	6	7	5	1	9	2	8	3	7	1
0	9	5	9	5	6	2	4	3	9	6

MULTITOSS



Screw 10 shoulder hooks in a board as shown in the illustration. Number these hooks from 1 to 10. Use fruit jar rubbers for tossing rings.

Set the board in the chalk tray and lean it against the blackboard. The player may stand back of a line 3 feet from the board. Each player may be given from 10 to 20 rings according to the skill of the class.

Take some number, such as 9, for the multiplier. Suppose the pupil rings the 3 hook. If he can give the product of 9×3 , the scorekeeper puts down the product, 27, under his name. If he cannot give the product in a reasonable time, he loses the throw the same as if he had failed to ring a hook. If he rings the 9 next, he says 81 and the scorekeeper enters that under the 27 in his score. After he has tossed all his rings, he adds up the numbers in his score. The player with the highest score wins the game.

After the class has played one game with 9 as the multiplier, 8, 7, 6, 5, etc., may be used in succession for the multiplier in other games.

This game also gives practice in addition if more than one score is made. The same board may be used for column addition by putting down the numbers of the hooks as they are ringed without using a multiplier. This game is a favorite with pupils because it involves skill as well as a knowledge of the combinations.

WRITTEN MULTIPLICATION. I

1. Katherine bought 4 cans of peaches at the store for 32 cents a can. How much did the 4 cans cost?

Addition:

32 cents
32 cents
32 cents
32 cents
128 cents

This problem may be worked in two ways. We may write 32 cents four times and add the four numbers to get the cost. It is much shorter, however, to work the problem by multiplication.

Multiplication:

32 cents
4
128 cents

In multiplication the multiplier 4 is placed under the 32 cents and we think 4 two's are 8 and write the 8 in units' place. 4 times 3 tens are 12 tens. 12 tens make 1 hundred and 2 tens over. Place the 2 in tens' place and the 1 in hundreds' place in the product. 4×32 cents = 128 cents. Express 128 cents in dollars and cents.

Multiply:

2.	3.	4.	5.	6.	7.	8.	9.
42	84	71	90	53	43	81	63
<u>3</u>	<u>2</u>	<u>4</u>	<u>6</u>	<u>3</u>	<u>2</u>	<u>5</u>	<u>3</u>
10.	11.	12.	13.	14.	15.	16.	17.
23	41	30	84	73	34	32	91
<u>3</u>	<u>2</u>	<u>3</u>	<u>2</u>	<u>3</u>	<u>2</u>	<u>4</u>	<u>6</u>
18.	19.	20.	21.	22.	23.	24.	
712	510	531	712	809	900	833	
<u>4</u>	<u>8</u>	<u>2</u>	<u>3</u>	<u>7</u>	<u>4</u>	<u>2</u>	

The Zero in the Multiplicand: In problem 5 show that 6×0 units = 0 units and that a zero must be put in units' place in the product, making the product 540. In problem 22, 7×0 tens = 0 tens, but there are 6 tens carried over from units' column, making 6 in tens' place in the product.

WRITTEN MULTIPLICATION. II

1. A farmer bought 6 cows at a sale at an average cost of \$83 a head. How much did he pay for the 6 cows?

Explanation: 6×3 units = 18 units. 18 units = 1 ten and 8 units. Write the 8 units in units' place in the product and save the 1 ten to be added in with the product of the tens. 6×8 tens = 48 tens. 48 tens + 1 ten (carried from product of units) = 49 tens. 49 tens = 4 hundreds and 9 tens. Then $6 \times \$83 = \$498$.

Multiply:

2.	3.	4.	5.	6.	7.	8.	9.	10.
45	29	60	71	79	87	34	90	89
<u>8</u>	<u>6</u>	<u>7</u>	<u>9</u>	<u>5</u>	<u>3</u>	<u>2</u>	<u>8</u>	<u>6</u>
11.	12.	13.	14.	15.	16.	17.	18.	19.
68	54	38	69	76	39	54	52	86
<u>9</u>	<u>7</u>	<u>5</u>	<u>2</u>	<u>6</u>	<u>3</u>	<u>4</u>	<u>2</u>	<u>9</u>
20.	21.	22.	23.	24.	25.	26.	27.	28.
65	37	85	49	56	27	76	68	98
<u>5</u>	<u>8</u>	<u>6</u>	<u>9</u>	<u>3</u>	<u>7</u>	<u>4</u>	<u>8</u>	<u>7</u>
29.	30.	31.	32.	33.	34.	35.	36.	37.
89	34	53	21	18	90	28	29	83
<u>7</u>	<u>6</u>	<u>9</u>	<u>8</u>	<u>7</u>	<u>6</u>	<u>9</u>	<u>4</u>	<u>8</u>
38.	39.	40.	41.	42.	43.	44.	45.	46.
78	72	46	94	41	38	19	62	79
<u>2</u>	<u>5</u>	<u>7</u>	<u>9</u>	<u>3</u>	<u>8</u>	<u>6</u>	<u>3</u>	<u>4</u>
47.	48.	49.	50.	51.	52.	53.	54.	55.
35	97	49	81	37	92	94	37	93
<u>7</u>	<u>4</u>	<u>8</u>	<u>2</u>	<u>6</u>	<u>7</u>	<u>5</u>	<u>7</u>	<u>9</u>

DRILL PROBLEMS IN MULTIPLICATION

1. 76 8	2. 23 9	3. 85 6	4. 78 9	5. 19 5	6. 26 6	7. 35 4	8. 89 3	9. 25 8
10. 48 4	11. 73 3	12. 58 5	13. 85 7	14. 68 9	15. 96 2	16. 17 4	17. 90 5	18. 69 1
19. 97 9	20. 98 6	21. 94 7	22. 89 4	23. 37 8	24. 29 3	25. 36 6	26. 35 4	27. 53 9
28. 69 8	29. 83 2	30. 74 5	31. 57 6	32. 67 7	33. 24 9	34. 83 3	35. 58 8	36. 65 3
37. 47 8	38. 36 5	39. 76 9	40. 89 6	41. 74 3	42. 94 7	43. 34 9	44. 85 7	45. 48 1
46. 42 2	47. 59 9	48. 58 3	49. 95 8	50. 79 4	51. 38 8	52. 36 6	53. 79 5	54. 60 3
55. 50 4	56. 57 6	57. 64 8	58. 58 2	59. 63 7	60. 86 4	61. 39 3	62. 28 5	63. 42 6
64. 79 2	65. 56 5	66. 24 4	67. 72 8	68. 27 7	69. 72 9	70. 24 3	71. 66 2	72. 97 8

Suggestion: First have the class multiply orally so that errors may be corrected. Then assign the problems for written work.

MULTIPLICATION OF U. S. MONEY

1. Fred sold 3 pecks of early potatoes at \$.45 a peck. How much did he receive for them?

\$1.35 Since he received \$.45 for each peck, for 3 pecks he received $3 \times \$.45$, or \$1.35.

\$1.35 What do we use to separate or "point off" dollars from cents? In multiplying a number containing *cents*, we must point off cents in the product. How many places must be pointed off for cents?

2. Martha bought a 6-pound roast at the meat market at \$.28 per pound. How much did it cost her?

3. Find the cost of 3 dozen eggs at \$.47 a dozen.

4. George raised 8 bushels of carrots and sold them for \$.65 a bushel. How much did he receive for them?

5. Ruth picked 27 quarts of strawberries for her mother. Her mother gave her 9 quarts for picking them. How much did she make if she sold the 9 quarts at \$.18 a quart?

6. Ellen bought 7 yards of dress goods at \$.49 a yard. How much did she pay for the goods?

7. She also bought 3 yards of ribbon at \$.18 a yard. Find the cost of the ribbon.

8. Henry raked a neighbor's yard one Saturday. He received 15 cents an hour and worked 5 hours. How much did he make?

9. A poultry raiser bought 5 dozen eggs for hatching. How much did they cost at \$.75 a dozen?

10. Find the cost of 6 boxes of currants at 15 cents a box.

11. Find the cost of 4 pounds of prunes at \$.28 a pound.

CAMPING SUPPLIES



1. A camping party had one of the boys drive a car to the city to buy supplies for them. He bought the following things at a grocery store: 3 dozen oranges at \$.45 a dozen; 8 cans of peas at \$.18 a can; 2 pounds of coffee at \$.45 a pound; 4 cans of salmon at \$.35 a can; 7 cans of pork and beans at \$.18 each, and 2 pecks of potatoes at \$.35 a peck. Find the total bill for these supplies.

2. Find the total for the supplies purchased at the meat market: 5 pounds of steak at \$.38 a pound; 3 pounds of bacon at \$.45 a pound, and 4 pounds of wieners at \$.24 per pound.

3. How much did he pay for these supplies which he bought at the bakery: 8 loaves of bread at \$.10 a loaf; 2 cakes at \$.65 each; 4 dozen doughnuts at \$.15 a dozen, and 8 pies at \$.20 each?

4. Find the total amount for all the supplies.

5. The men gave him 4 five-dollar bills. How much money did he take with him? How much did he have left?

6. The camping party used 6 quarts of milk per day at 12 cents a quart. What did the milk cost per week?

Encourage pupils to keep accurate accounts of the expenses of any camping trip on which they go and make a list of problems for the class to solve.

REVIEW PROBLEMS

1. Walter found that a gallon of gasoline would drive their car an average distance of 13 miles. How far can he drive it on 5 gallons of gasoline?

2. Joseph raised corn on a 7-acre field which yielded 68 bushels per acre. How many bushels of corn did he raise on this field?

3. A bushel of shelled corn weighs 56 pounds. What is the weight of 6 bushels of shelled seed corn?

4. Can you lift a 2-bushel sack of wheat? A bushel of wheat weighs 60 pounds. How much do 2 bushels of wheat weigh?

5. Richard drove his father's car at an average speed of 16 miles per hour for 5 hours. How many miles did he go in that time?

6. A factory worker gets 76 cents an hour for 8 hours a day. How much does he receive per day?

7. Edward wished to set out a strawberry patch. He found that he needed 64 plants, set a foot apart, for each row. He wanted to set out 4 rows. How many plants did he need to order?

8. Some third-grade boys ordered 6 baseball gloves at \$.75 each. How much did all the gloves cost them?

9. An express train, which goes 45 miles an hour, will go how far in 5 hours?

10. Mr. Davis rented a house for \$35 a month. How much rent did he pay in 6 months?

11. The Lincoln Grade School Athletic Association bought 8 practice baseballs at \$.95 each. What was the total amount paid for the eight baseballs?

WRITTEN MULTIPLICATION. III

1. A dairyman sold 6 of his best cows for an average price of \$398 apiece. How much did he receive for the 6 cows?

\$398 Explanation: How many hundreds, tens, and units
6 are there in 398? 6×8 units = 48 units. $48 = 4$ tens
\$2,388 and 8 units. Place the 8 in units' place in the product
 and carry the 4 tens in your mind. 6×9 tens = 54
 tens. 54 tens + 4 tens = 58 tens. 58 tens = 5 hundreds
 and 8 tens. Write the 8 in tens' place and carry the 5 hundreds
 in your mind. 6×3 hundreds = 18 hundreds. 18 hundreds + 5
 hundreds = 23 hundreds. 23 hundreds = 2 thousand and 3
 hundreds. The product may be read either *twenty-three hun-*
dred eighty-eight dollars or *two thousand three hundred eighty-*
eight dollars.

Multiply:

2. 329 7	3. 385 2	4. 960 9	5. 257 6	6. 569 3	7. 470 8	8. 685 7
9. 709 5	10. 986 6	11. 487 9	12. 574 4	13. 286 8	14. 248 3	15. 803 5
16. 470 7	17. 835 8	18. 625 9	19. 469 2	20. 893 6	21. 389 4	22. 583 9
23. 479 8	24. 378 3	25. 704 6	26. 649 7	27. 465 5	28. 691 2	29. 708 4
30. 947 9	31. 603 6	32. 279 5	33. 758 7	34. 459 4	35. 605 8	36. 963 3

WRITTEN MULTIPLICATION

37. 923 <u>8</u>	38. 831 <u>7</u>	39. 263 <u>9</u>	40. 890 <u>6</u>	41. 738 <u>2</u>	42. 264 <u>7</u>	43. 749 <u>9</u>
44. 879 <u>4</u>	45. 748 <u>8</u>	46. 985 <u>5</u>	47. 489 <u>1</u>	48. 968 <u>3</u>	49. 673 <u>6</u>	50. 995 <u>7</u>
51. 526 <u>4</u>	52. 538 <u>9</u>	53. 593 <u>8</u>	54. 280 <u>2</u>	55. 768 <u>5</u>	56. 375 <u>3</u>	57. 726 <u>8</u>
58. 647 <u>9</u>	59. 485 <u>7</u>	60. 627 <u>6</u>	61. 590 <u>4</u>	62. 719 <u>5</u>	63. 689 <u>8</u>	64. 845 <u>2</u>
65. 907 <u>3</u>	66. 955 <u>6</u>	67. 918 <u>9</u>	68. 378 <u>4</u>	69. 543 <u>8</u>	70. 648 <u>3</u>	71. 763 <u>7</u>
72. 253 <u>9</u>	73. 268 <u>5</u>	74. 934 <u>4</u>	75. 379 <u>2</u>	76. 529 <u>3</u>	77. 637 <u>8</u>	78. 684 <u>6</u>
79. 574 <u>7</u>	80. 642 <u>9</u>	81. 513 <u>6</u>	82. 570 <u>4</u>	83. 593 <u>9</u>	84. 956 <u>5</u>	85. 815 <u>8</u>
86. 681 <u>4</u>	87. 387 <u>3</u>	88. 270 <u>6</u>	89. 368 <u>7</u>	90. 687 <u>9</u>	91. 294 <u>8</u>	92. 968 <u>2</u>

1. A gardener raised 3 acres of potatoes which yielded 189 bushels per acre. How many bushels did he raise on the 3 acres?

2. A farmer delivered 8 barrels of apples to a customer. At 160 pounds per barrel, what was the weight of his load?

3. Mabel bought 6 yards of dress goods for her mother at \$1.98 per yard. How much did she pay for the 6 yards?

4. Mr. Dixon used 9 tons of coal during the winter. How much did this coal cost at \$9.75 a ton?

5. A grocer bought 6 crates of grapefruit with 64 in each crate. How many grapefruit were there in all 6 crates?

6. Find the cost of 5 barrels of apples at \$5.70 a barrel.

7. Mr. Powers bought a building lot for \$975 and built a house on it that cost 6 times as much. How much did the house cost? Find the total cost of the lot and house.

8. An automobile dealer sold 7 used cars at an average price of \$459 each. How much did he receive for the 7 cars?

9. In a grade school of 8 rooms, there is an average of 38 pupils per room. How many pupils are there in the school?

10. Find the cost of 3 pairs of roller skates at \$2.65 per pair.

11. Find the cost of 2 tennis rackets at \$3.50 each.

12. A farmer sold 9 steers for \$167 each. How much did he receive for them?

DIVISION

Each pupil in the class should be drilled on these division exercises until he can give all the quotients in each exercise in the time limit set as *fair*. Encourage pupils to work for the *good* and *excellent* time limits. The following time limits should be used for oral work; for written work allow $1\frac{2}{5}$ times as long:

Excellent 40 seconds; *Good* 50 seconds; *Fair* 60 seconds.

DRILL X

2) $\overline{4}$	6) $\overline{0}$	7) $\overline{14}$	2) $\overline{12}$	2) $\overline{0}$	7) $\overline{7}$	8) $\overline{16}$
4) $\overline{4}$	7) $\overline{0}$	4) $\overline{8}$	5) $\overline{5}$	3) $\overline{0}$	5) $\overline{25}$	5) $\overline{10}$
2) $\overline{2}$	9) $\overline{0}$	2) $\overline{10}$	3) $\overline{9}$	8) $\overline{8}$	8) $\overline{0}$	4) $\overline{16}$
2) $\overline{8}$	6) $\overline{6}$	3) $\overline{12}$	5) $\overline{15}$	6) $\overline{12}$	2) $\overline{6}$	

DRILL Y

9) $\overline{18}$	9) $\overline{9}$	3) $\overline{6}$	7) $\overline{21}$	9) $\overline{27}$	3) $\overline{18}$	4) $\overline{20}$
2) $\overline{14}$	3) $\overline{15}$	7) $\overline{35}$	2) $\overline{18}$	6) $\overline{24}$	6) $\overline{30}$	3) $\overline{3}$
5) $\overline{0}$	3) $\overline{21}$	6) $\overline{36}$	5) $\overline{30}$	4) $\overline{24}$	5) $\overline{20}$	4) $\overline{12}$
7) $\overline{42}$	2) $\overline{16}$	6) $\overline{42}$	4) $\overline{0}$	6) $\overline{18}$	7) $\overline{49}$	

DRILL Z

7) $\overline{28}$	5) $\overline{40}$	8) $\overline{48}$	5) $\overline{45}$	3) $\overline{24}$	7) $\overline{56}$	8) $\overline{40}$
9) $\overline{36}$	9) $\overline{81}$	6) $\overline{54}$	4) $\overline{28}$	3) $\overline{27}$	9) $\overline{54}$	8) $\overline{32}$
8) $\overline{24}$	6) $\overline{48}$	8) $\overline{72}$	9) $\overline{63}$	9) $\overline{45}$	8) $\overline{64}$	7) $\overline{63}$
9) $\overline{72}$	4) $\overline{32}$	8) $\overline{56}$	5) $\overline{35}$	4) $\overline{36}$		

1. On Robert's twelfth birthday, his father gave him $\frac{1}{2}$ of \$24 with which to start a savings account. How much did he give Robert?¹

2. There were 36 cookies in the jar. Mother gave Helen $\frac{1}{3}$ of them for a picnic. How many did Helen have?

3. There are 44 children in a room. The teacher sent $\frac{1}{2}$ of them to the library. How many went to the library?

4. Fred's hens laid 48 eggs in 4 days. That was an average of how many each day?

5. There were 26 potatoes left in the basket. The cook used $\frac{1}{2}$ of them. How many did she use?

6. A florist had 48 carnations in his shop. A lady bought $\frac{1}{2}$ of them. How many did she buy?

7. Roger spent $\frac{1}{3}$ of the 96 cents which he had saved. How much did he spend?

8.	9.	10.	11.	12.	13.
$2\overline{)68}$	$3\overline{)69}$	$4\overline{)84}$	$7\overline{)70}$	$3\overline{)30}$	$3\overline{)63}$
14.	15.	16.	17.	18.	19.
$5\overline{)50}$	$2\overline{)84}$	$6\overline{)60}$	$2\overline{)22}$	$2\overline{)40}$	$3\overline{)90}$
20.	21.	22.	23.	24.	25.
$5\overline{)105}$	$8\overline{)168}$	$4\overline{)120}$	$9\overline{)189}$	$6\overline{)120}$	$7\overline{)147}$

¹When the children see they do not know $\frac{1}{2}$ of \$24, the teacher may explain: $2\overline{)24}$ or $\frac{1}{2}$ of 2 tens = 1 ten. We write the 1 ten over the tens' column above the horizontal line. $\frac{1}{2}$ of 4 units = 2 units. Write the 2 in units' place above the horizontal line. We find $\frac{1}{2}$ of \$24 or 24 apples or 24 of anything in the same way. Show in problem 11 that 7 tens $\div$ 7 = 1 ten and 0 units $\div$ 7 = 0 units. Show that 0 divided by any number gives 0 as a quotient.

1.—9. Divide each of the following numbers by 2 and give the remainders as follows: in $9 \div 2$ say 4 and 1 over.

9 19 3 15 13 7 17 11 5

1.—18. Divide by 3 in the same way:

14 4 26 16 25 29 11 8 20
7 5 28 23 13 19 22 17 10

1.—27. Divide by 4:

37 11 25 30 33 5 21 13 39
26 6 10 38 22 9 35 19 23
29 18 27 17 15 7 31 14 34

1.—36. Divide by 5:

11 47 8 37 16 31 44 17 34
13 49 6 46 26 41 22 19 24
23 28 9 36 18 43 21 14 48
29 39 7 42 33 38 12 32 27

1.—45. Divide by 6:

33 11 26 9 29 56 38 20 52
23 13 58 8 35 16 32 39 21
10 55 15 7 41 57 14 37 53
19 45 25 17 51 50 22 44 34
27 40 28 43 59 46 31 49 47

Drill on division facts with remainders is essential to effective work in short division involving reduction. An experiment involving division facts with remainders and those without remainders showed that it took twice as long to give the facts with remainders as it did those without remainders. Drill on the exercises on these two pages will make the pupils more efficient in this type of work.

1.—54. Divide by 7:

33	46	9	66	30	69	26	41	22
15	50	8	53	37	24	64	12	44
16	68	10	32	43	67	19	48	29
13	40	65	25	58	11	57	17	47
62	18	34	55	27	38	23	54	31
60	20	45	61	36	52	39	59	51

1.—63. Divide by 8:

21	65	37	79	18	52	9	31	55
23	12	76	27	36	68	10	67	22
73	43	17	20	41	34	58	11	66
59	26	38	63	29	35	13	69	39
19	44	78	15	33	50	25	28	61
30	75	14	45	77	42	62	47	74
46	51	71	60	49	54	57	70	53

1.—72. Divide by 9:

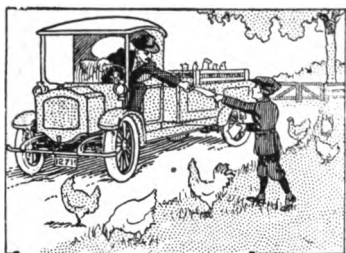
56	32	12	82	35	50	25	57	53
14	88	41	67	23	37	62	29	21
11	43	86	52	28	30	44	61	75
38	10	17	24	80	66	34	46	76
15	58	69	22	65	73	59	39	83
31	87	48	20	70	47	77	16	74
85	51	13	26	60	79	42	89	64
49	33	78	40	68	71	55	84	19

The drills on this and the preceding page should be constantly used, preferably for a short, snappy oral drill at the beginning of each lesson in short division.

If these drills are used for written work, the quotient should be placed over the last figure of the dividend. The remainder may be indicated by a small figure at the right of the division form as shown in the illustration. This will save writing it out in the form $\frac{2}{9}$.

$$\begin{array}{r} 6 \\ 9 \overline{)56} \end{array} \begin{array}{l} 2 \\ 2 \end{array}$$

SHORT DIVISION



1. Howard had 54 chickens and sold $\frac{1}{2}$ of them. How many did he sell?¹

2. Marion's mother gave her $\frac{1}{4}$ of the books on a shelf with which to start her own library. There were 56 books on

the shelf. How many did Marion receive?

3. The children in a geography class bought a set of 144 post cards to use in their microscope. $\frac{1}{4}$ of the cards were views of New York City; $\frac{1}{6}$ of them were pictures of Chicago; $\frac{1}{3}$ of them were scenes in Yellowstone Park and the Rocky Mountains. The rest were on different subjects. How many views of New York were there?

4. How many cards were pictures of Chicago?

5. How many were scenes in Yellowstone Park and the Rocky Mountains?

6. 384 children in a grade school went at different times during a month to visit a museum. Once $\frac{1}{6}$ of them went; another time $\frac{1}{8}$ of them visited it. How many went the first time?

7. How many were in the group the second time?

¹These are the first division problems involving reduction. Explain that $\frac{1}{2}$ of 5 tens = 2 tens with 1 remaining. The 2 is written in the quotient in tens' column. The 1 ten remaining is added to the 4 units. $\frac{1}{2}$ of 14 units = 7 units. The 7 is written in the quotient in units' place. Use the same plan in problems involving hundreds and thousands.

PROBLEMS IN SHORT DIVISION

- | | | | | |
|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|
| 1. $3 \overline{)144}$ | 2. $5 \overline{)285}$ | 3. $4 \overline{)184}$ | 4. $2 \overline{)118}$ | 5. $6 \overline{)468}$ |
| 6. $7 \overline{)168}$ | 7. $9 \overline{)135}$ | 8. $8 \overline{)184}$ | 9. $4 \overline{)356}$ | 10. $5 \overline{)170}$ |
| 11. $6 \overline{)234}$ | 12. $7 \overline{)532}$ | 13. $3 \overline{)291}$ | 14. $8 \overline{)536}$ | 15. $9 \overline{)648}$ |
| 16. $2 \overline{)174}$ | 17. $9 \overline{)567}$ | 18. $7 \overline{)581}$ | 19. $6 \overline{)276}$ | 20. $7 \overline{)665}$ |
| 21. $5 \overline{)445}$ | 22. $8 \overline{)752}$ | 23. $9 \overline{)846}$ | 24. $4 \overline{)300}$ | 25. $8 \overline{)680}$ |
| 26. $3 \overline{)207}$ | 27. $9 \overline{)756}$ | 28. $5 \overline{)130}$ | 29. $4 \overline{)148}$ | 30. $7 \overline{)623}$ |
| 31. $3 \overline{)174}$ | 32. $6 \overline{)564}$ | 33. $8 \overline{)296}$ | 34. $9 \overline{)513}$ | 35. $4 \overline{)356}$ |
| 36. $7 \overline{)329}$ | 37. $6 \overline{)498}$ | 38. $9 \overline{)801}$ | 39. $5 \overline{)485}$ | 40. $8 \overline{)680}$ |
| 41. $3 \overline{)195}$ | 42. $9 \overline{)558}$ | 43. $6 \overline{)372}$ | 44. $7 \overline{)455}$ | 45. $2 \overline{)190}$ |
| 46. $9 \overline{)324}$ | 47. $7 \overline{)378}$ | 48. $3 \overline{)282}$ | 49. $3 \overline{)951}$ | 50. $8 \overline{)992}$ |

ZERO IN THE QUOTIENT¹

- | | | | |
|--------------------------|--------------------------|--------------------------|--------------------------|
| 1. $8 \overline{)2960}$ | 2. $4 \overline{)3120}$ | 3. $9 \overline{)3060}$ | 4. $4 \overline{)1800}$ |
| 5. $9 \overline{)7209}$ | 6. $6 \overline{)4806}$ | 7. $5 \overline{)4505}$ | 8. $2 \overline{)1202}$ |
| 9. $4 \overline{)2804}$ | 10. $6 \overline{)3006}$ | 11. $8 \overline{)5608}$ | 12. $9 \overline{)6309}$ |
| 13. $7 \overline{)6307}$ | 14. $3 \overline{)2403}$ | 15. $8 \overline{)7208}$ | 16. $5 \overline{)3540}$ |
| 17. $4 \overline{)3236}$ | 18. $9 \overline{)7281}$ | 19. $6 \overline{)5442}$ | 20. $8 \overline{)6448}$ |

¹Insistence that the figure in the quotient be placed directly above (or below) the last figure used in the dividend, and that zeros be used to fill in spaces where the divisor is not contained once or more, will make this step clear.

THE REMAINDER IN DIVISION

1. $5 \overline{)4884}$	2. $3 \overline{)2962}$	3. $2 \overline{)1952}$	4. $8 \overline{)5971}$
5. $7 \overline{)6639}$	6. $4 \overline{)3517}$	7. $9 \overline{)8057}$	8. $6 \overline{)5360}$
9. $5 \overline{)4217}$	10. $8 \overline{)3075}$	11. $3 \overline{)2935}$	12. $9 \overline{)4287}$
13. $8 \overline{)4749}$	14. $7 \overline{)2851}$	15. $4 \overline{)2389}$	16. $6 \overline{)3289}$
17. $9 \overline{)3128}$	18. $5 \overline{)3523}$	19. $7 \overline{)3739}$	20. $8 \overline{)7587}$
21. $6 \overline{)5377}$	22. $7 \overline{)4889}$	23. $4 \overline{)1915}$	24. $6 \overline{)4159}$
25. $3 \overline{)1697}$	26. $8 \overline{)6347}$	27. $7 \overline{)4789}$	28. $9 \overline{)7589}$
29. $4 \overline{)2759}$	30. $9 \overline{)8605}$	31. $8 \overline{)4539}$	32. $7 \overline{)5147}$
33. $3 \overline{)2959}$	34. $9 \overline{)6167}$	35. $4 \overline{)2945}$	36. $5 \overline{)4542}$
37. $8 \overline{)4749}$	38. $6 \overline{)4475}$	39. $2 \overline{)7597}$	40. $9 \overline{)6625}$

The above problems all have remainders in the quotient. Introduce the fractional form of writing the remainder. In problem 1, for example, the remainder 4 divided by the divisor 5 is written as a fraction $\frac{4}{5}$ in the quotient.

PRACTICE PROBLEMS

- 1—5. Divide 5040 by 2; by 7; by 4; by 5; by 6.
 6—10. Divide 9072 by 6; by 7; by 8; by 3; by 9.
 11—15. Divide 2592 by 9; by 8; by 2; by 4; by 3.
 16—20. Divide 8360 by 8; by 4; by 9; by 5; by 7.
 21—25. Divide 12096 by 6; by 7; by 4; by 8; by 9.
 26—30. Divide 9072 by 3; by 7; by 8; by 6; by 9.
 31—38. Divide 362,880 by 2; 3; 4; 5; 6; 7; 8; 9.
 39—46. Divide 725,760 by 2; 3; 4; 5; 6; 7; 8; 9.

1. Three boys made a profit of \$27.45 on a refreshment stand at a street fair. They divided the profits equally. How much did each receive?

$\$7.??$ In dividing U. S. money we must remember to
 3) $\$27.45$ point off *two places* for *cents* in the quotient if there
 are cents in the dividend.

- | | | |
|-------------------------|-------------------------|--------------------------|
| 2. $\$5.42 \div 2 = ?$ | 3. $\$7.75 \div 5 = ?$ | 4. $\$5.85 \div 3 = ?$ |
| 5. $\$9.45 \div 9 = ?$ | 6. $\$8.96 \div 7 = ?$ | 7. $\$16.38 \div 6 = ?$ |
| 8. $\$7.40 \div 2 = ?$ | 9. $\$5.40 \div 3 = ?$ | 10. $\$14.08 \div 8 = ?$ |
| 11. $\$8.44 \div 4 = ?$ | 12. $\$7.55 \div 5 = ?$ | 13. $\$22.32 \div 9 = ?$ |
| 14. $\$9.24 \div 6 = ?$ | 15. $\$7.35 \div 7 = ?$ | 16. $\$88.32 \div 8 = ?$ |
| 17. $\$8.95 \div 5 = ?$ | 18. $\$8.43 \div 3 = ?$ | 19. $\$17.01 \div 9 = ?$ |
| 20. $\$4.80 \div 2 = ?$ | 21. $\$5.68 \div 4 = ?$ | 22. $\$48.65 \div 7 = ?$ |
| 23. $\$9.36 \div 9 = ?$ | 24. $\$7.85 \div 5 = ?$ | 25. $\$52.38 \div 6 = ?$ |

26. Ethel sold 6 chickens for \$6.72. What was the average price which she received per chicken?

27. Donald raised 7 bushels of early potatoes which he sold for \$9.45. What did he receive per bushel?

28. A laborer in a factory receives \$28.50 per week of 6 working days. How much does he receive per day?

29. A newsboy made \$7.16 in 4 weeks. What was the average amount which he made per week?

30. Harry helped a neighbor clean up his yard. He received \$1.35 for 9 hours' work. How much was that per hour?

Have pupils bring original problems to class involving division of U. S. money. These should be based on actual experiences by the pupils or their parents.

REVIEW PROBLEMS

1. A farmer sold 5 cows at an average price of \$136 each. How much did he receive for the 5 cows?

2. He divided this money equally among his 4 children. How much did each one receive?

3. There are 5280 feet in a mile. How many feet make a yard? Then how many yards are there in a mile?

4. A gardener raised 1395 bushels of potatoes on 9 acres of ground. What was his average yield per acre?

5. A ranch owner had 167 fleeces of wool averaging 8 pounds each. How many pounds of wool did he have?

6. A 2-bushel sack of wheat contains 120 pounds of wheat. How many pounds do 8 such sacks weigh?

7. A farmer raised 6 bales of cotton which weighed 2988 pounds. What was the average weight per bale?

8. Martha's mother bought a davenport for \$98, agreeing to pay \$7 per month until that amount was paid. How many such payments did she have to make?

*The purpose of this list of problems is to give the pupils practice in telling when to use multiplication and when to use division. Show that: (1) when the cost of *one* thing and the *number* of things are given, we *multiply* to find the *total* cost; (2) when the *total* cost and the cost of *one* thing are given, we *divide* to find the *number* of things.

Teach the pupil to ask himself these questions: (1) What have I given? (2) What am I to find? (3) What process must I use to obtain this result? If necessary, use simple problems involving the same process to help the pupil to see the process in the more difficult problem.

9. A woman left property worth \$4500 to be divided equally among her 3 children. How much did each receive?

10. Ruth receives an allowance of \$1.05 per week for spending money. How much does she receive per day?

11. A farmer sold 8 hogs at an average price of \$38.25 each. How much did he receive for the 8 hogs?

12. Another farmer sold 6 hogs for \$208.50. What was the average price which he received for each hog?

13. Mabel sold 7 baskets of grapes at \$.35 per basket. How much did she receive for them?

14. A real estate dealer sold 6 lots at a summer resort for \$275 each. How much did he get for the 6 lots?

15. Mildred's mother gave her 8 quarts of raspberries to sell. She sold them for \$2.24. How much did she charge per quart?

16. A Guernsey cow gave 56 pounds of milk per day for one week in the summer. Counting a quart of milk as weighing 2 pounds, how many quarts of milk did this cow give? That number of quarts equals how many gallons?

17. An express train traveled 256 miles in 8 hours. What was the average speed in miles per hour of this train?

18. A merchant bought 144 tumblers. How many sets of 6 tumblers per set did he have in that shipment?

TELLING TIME WITH ROMAN NUMERALS



Some clock faces have the Roman numbers instead of the regular figures. Compare the Roman numbers on the clock face at the right with the numbers on the other clock face to see what each Roman number equals.

I = ? II = ? III = ? IV = ? V = ? VI = ? VII = ? VIII = ?
IX = ? X = ? XI = ? XII = ?

Notice that the I placed in front of the V means 1 from 5, or

4. I placed after V means $5 + 1 = 6$. VII = $5 + 2 = ?$

VIII = $5 + 3 = ?$

XI = $10 + 1 = ?$

IX = 1 from 10 = ?

XII = $10 + 2 = ?$

1. What time is it by these clock faces? How many minute spaces from XII to I? The minute hand is now 1 more minute space past the I. It is how many minute spaces past the XII? We say it is now 6 minutes past 9.

2. Show where the minute hand will point when it is 13 minutes past 9; when it is 24 minutes past 9.

3. How many minute spaces between X and XII? If the minute hand points 3 spaces in front of the X, how many minute spaces is this hand in front of the XII. Draw a clock face to show 13 minutes to 2; one to show 18 minutes to 3.

4. How many minute spaces does the minute hand pass over in 1 hour? How many in $\frac{1}{2}$ hour? How many in $\frac{1}{4}$ hour?

The teacher should be provided with a cardboard clock face or an old clock, the hands of which she can turn. Give much practice in telling time correctly to the minute.

REVIEW PRACTICE PROBLEMS IN U. S. MONEY

1. Our	A	\$126.75
2. United	C	43.91
3. States	D	2.80
4. Money	E	65.32
5. includes	F	49.25
6. cents,	G	861.14
7. nickels,	H	231.19
8. dimes,	I	320.19
9. quarters,	K	48.37
10. halves,	L	621.20
11. dollars,	M	115.87
12. ones,	N	35.73
13. twos,	O	630.24
14. fives,	P	28.10
15. tens,	Q	263.15
16. twenties,	R	530.12
17. fifties,	S	91.14
18. hundreds,	T	440.16
19. gold,	U	72.19
20. silver,	V	82.11
21. paper,	W	27.36
22. alloy.	Y	946.28

Beginning with the letters forming the first word, write successively the amount opposite the index letter and find the sum as illustrated below. Follow with the other words in like manner.

$$\begin{array}{r}
 (\text{o}) \quad \$630.24 \\
 (\text{U}) \quad 72.19 \\
 (\text{R}) \quad \underline{530.12} \\
 \qquad \qquad \qquad ?
 \end{array}$$



STORE PROBLEMS

1. Fred and his playmates had a picnic at the beach. They broiled bacon on forked sticks and roasted potatoes. What did their lunch cost altogether?

$\frac{1}{2}$ pound bacon at \$.42 a pound.
 1 dozen rolls at \$.15 a dozen.
 $\frac{1}{4}$ pound butter at \$.56 a pound.
 $\frac{1}{2}$ dozen bananas at \$.40 a dozen.

\$.14 worth of potatoes.
 1 pie at \$.20.
 $\frac{1}{2}$ dozen lemons at \$.30 a dozen.
 Sugar for lemonade \$.05.

2. There were 6 boys in the party. What was each one's share of the lunch?

Mrs. Gray's grocery lists for 4 days were as follows:

3. Monday

$\frac{1}{2}$ bu. potatoes at \$1.20 a bu.
 2 lb. lard at \$.28 a lb
 1 sack of flour \$1.50.
 2 qt. vinegar at \$.15 a qt.
 20 lb. sugar at \$.11 a lb.

5. Wednesday

1 lb. coffee at \$.45 a lb.
 $\frac{1}{2}$ doz. lemons at \$.30 a dozen.
 5 lb. rice at \$.15 a lb.
 3 lb. prunes at \$.25 a lb.
 $\frac{1}{2}$ lb. nutmeats at \$.70 a lb.

4. Tuesday

2 qt. molasses at \$.18 a qt.
 1 can baking powder \$.25.
 1 box soda \$.12.
 1 dozen eggs \$.42.
 2 boxes raisins at \$.18 a box.

6. Thursday

3 stalks celery at \$.10 a stalk.
 $\frac{1}{2}$ lb. cheese at \$.42 a lb.
 2 cans tomato soup at \$.10 a can.
 2 loaves of bread at \$.10 a loaf.
 $\frac{1}{2}$ dozen oranges at \$.60 a dozen.

7. Find the amount of each day's list.

8. What is the total amount of her purchases?

Helen's mother used the following supplies in making nut fudge:

4 lb. sugar at \$.11 a lb.; 1 cake chocolate at \$.25 a cake;
 $\frac{1}{2}$ lb. walnut meats at \$.70; $\frac{1}{3}$ lb. butter at \$.57 a lb.;
 1 quart of milk at \$.12

9. What did the materials cost her? She had 5 pounds of candy. What was the cost per pound?

PART II

ADDING IN BUSINESS



A great many business positions require people who can add *rapidly* and *accurately*. You have already learned how to add, but you need to practice a great deal to be accurate and rapid enough to fill a good business position.

1. A clerk sold the following materials to a customer: Silk dress \$23.75; pair of shoes \$6.75; ribbon \$1.35; handkerchief \$.35; buttons \$.24; gingham dress goods \$2.16; thread \$.05; lace \$.75. Put these items down in a column and find the total amount which the customer owed.

2. A merchant made the following deposits in a bank during a week: Monday \$183.95; Tuesday \$159.25; Wednesday \$138.75; Thursday \$167.45; Friday \$146.95; Saturday \$194.60. Find the total amount of his deposits during the week.

3. A bookkeeper had to add the following amounts: \$1.75; \$1.29; \$.87; \$2.43; \$1.27; \$1.40; \$.55; \$1.87. and \$2.09. Find the total of these amounts.

READING LARGE NUMBERS

In order that we may read them more easily, large numbers are pointed off with commas into groups of three places each, beginning at the right.

Millions	Thousands	Units
5,	737,	492

The above number is read: *five million, seven hundred thirty-seven thousand, four hundred ninety-two.*

1. What is the name of the first group at the right side of the above number? What is the name of the second group? How many figures compose the third group? What is the name of the third group?

2. Do you read many large numbers? Where do you find some of them?

The number given above shows the population of New York City in a recent year. New York is the largest city in our country.

Read the following facts which contain large numbers:

In 1850 there were only 4,336,719 horses in the United States. In 1918 there were 21,563,000 horses in our country.

In 1800 only 153,509 bales of cotton were produced in the United States, while in 1918 we raised over 11,231,000 bales.

We rarely use numbers larger than millions, but you may like to know that the next group to the left of millions is called *billions*.

ORAL TIME DRILL FOR BLACKBOARD AND DESK

A	VIII	IX	X	XI	XII	XIII	XIV	D
VII	3	5	4	1	6	7	2	
VI	6	7	8	6	5	3	7	
V	4	1	2	7	4	9	3	
IV	7	8	9	5	6	4	8	
III	2	3	7	3	9	5	2	
II	8	6	9	1	6	8	1	
I	4	2	5	9	8	3	9	
C								B

A recitation is not properly begun without a few minutes of quick drill work. Timing each pupil and keeping his record motivates such work.

1. Add rows I to VII from left to right.
2. Add rows I to VII from right to left.
3. Add columns VIII to XIV from top to bottom.
4. Add columns VIII to XIV from bottom to top.

By the use of a pointer to trace the line the combinations on the diagonal lines may also be utilized.

A blackboard copy of this drill permits changing the order of the figures from time to time thereby insuring that the children are not learning the answers from their position in the diagram. The drill may be oral or written.

DRILL IN ADDITION

Add from the top down:

1.	2.	3.	4.	5.	6.	7.	8.	9.	10	11.	12.
2	4	7	5	3	4	1	9	4	4	9	3
6	2	8	6	8	6	6	5	7	9	6	3
4	6	0	4	8	9	8	5	5	5	7	1
9	9	4	2	3	2	2	6	7	8	7	4
2	7	9	3	2	7	9	6	6	8	5	3
3	7	5	8	4	5	6	1	1	6	8	9
8	5	6	8	9	5	7	8	5	9	5	9
3	9	8	7	5	6	9	5	8	8	9	2
9	8	7	9	8	9	4	5	9	8	7	0
7	3	4	3	6	6	4	8	9	9	8	7
—	—	—	—	—	—	—	—	—	—	—	—
13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.
7	5	2	8	5	7	2	3	7	4	2	3
7	8	9	9	5	7	6	5	6	7	3	9
3	2	1	0	9	8	5	7	6	7	2	6
3	6	4	2	7	9	9	9	4	8	7	5
8	4	8	6	9	9	4	5	7	4	8	3
6	9	9	2	7	3	6	6	8	8	9	7
4	7	8	9	6	3	8	7	6	7	3	4
9	5	7	6	7	3	9	8	3	9	5	2
5	7	5	1	6	9	3	3	9	9	9	6
8	6	9	5	8	8	7	8	6	8	2	7
—	—	—	—	—	—	—	—	—	—	—	—

Some pupils are able to add columns of 4 or 5 figures in depth very rapidly and accurately, but in columns of this length they get "hung up" in the middle of the problem. The difficulty is in the span of the attention. In order to increase this span of attention and give the pupils the ability to add columns of this length, it is a good plan to do the work orally and have the pupils give the results for adding each figure at regular intervals. These regular intervals may be set by the teacher tapping with a pointer.

Find the correct sums for the following sales slips:

1. Jar rubbers \$.48; sugar \$1.05; bread \$.30; butter \$.60; puffed rice \$.13; lard \$.40.
2. Kerosene \$.80; bread \$.15; starch \$.12; Old Dutch Cleanser \$.10; soap \$.14.
3. Tea \$.45; bread \$.30; can of pineapple \$.38; oranges \$.23; can of peas \$.23; bananas \$.16.
4. Crackers \$.22; Crisco \$.34; butter \$.60; sugar \$.55.
5. Bread \$.15; eggs \$.35; cocoa \$.25; dried beef \$.15; potatoes \$.25.
6. Kerosene \$.80; yeast \$.03; Jello \$.20; bananas \$.17; walnut meats \$.25; bread \$.15.
7. Lux \$.15; bread \$.15; Shaker salt \$.10; Puffed Rice \$.15; oranges \$.30.
8. Butter \$.63; cocoa \$.25; seedless raisins \$.19; rolled oats \$.28; cookies \$.18.
9. Bread \$.20; vinegar \$.12; lemons \$.12; peanut butter \$.15; kerosene \$.64.
10. Oranges \$.45; can of peas \$.23; bread \$.15; soap \$.14; cold boiled ham \$.48; eggs \$.35.
11. Butter \$.61; bananas \$.37; Puffed Rice \$.15; bacon \$.28; new potatoes \$.35.
12. Kerosene \$.80; bread \$.15; soap \$.14; dried beef \$.25.
13. Find the total amount of the 12 sales slips.

Have the pupils bring grocery slips from home to furnish additional problems.

HOW CIVIL SERVICE WORKERS ADD

Men and women who work in government offices are frequently interrupted. In order that they may not forget the sum of each column and have to begin at the beginning again, they set down the sum of each column as they get it. For example, the sum of the units' column is 42. Set this down with the 2 under units' column and the 4 under tens' column. The sum of the tens' column (not "carrying" the 4) is 33. Set the 3 tens in tens' column and the other 3 representing hundreds in hundreds' column. After the hundreds' column is added and set down, the *three partial results* are added to give the *whole sum*, 4372.

Add the following by the Civil Service method.

1.	2.	3.	4.	5.	6.
746	723	969	775	781	863
269	867	795	520	568	479
877	855	879	875	354	709
192	913	723	978	638	248
658	349	392	662	814	985
<u>457</u>	<u>398</u>	<u>996</u>	<u>648</u>	<u>494</u>	<u>957</u>

7.	8.	9.	10.	11.	12.
877	891	749	388	476	569
595	889	550	968	905	778
678	240	995	549	945	459
409	676	979	706	593	749
256	599	686	756	778	697
<u>589</u>	<u>637</u>	<u>622</u>	<u>987</u>	<u>439</u>	<u>269</u>

HOW OLD ARE YOU?

A

1	3	5	7	9	11	13	15
17	19	21	23	25	27	29	31
33	35	37	39	41	43	45	47
49	51	53	55	57	59	61	63

B

2	3	6	7	10	11	14	15
18	19	22	23	26	27	30	31
34	35	38	39	42	43	46	47
50	51	54	55	58	59	62	63

C

4	5	6	7	12	13	14	15
20	21	22	23	28	29	30	31
36	37	38	39	44	45	46	47
52	53	54	55	60	61	62	63

D

8	9	10	11	12	13	14	15
24	25	26	27	28	29	30	31
40	41	42	43	44	45	46	47
56	57	58	59	60	61	62	63

E

16	17	18	19	20	21	22	23
24	25	26	27	28	29	30	31
48	49	50	51	52	53	54	55
56	57	58	59	60	61	62	63

F

32	33	34	35	36	37	38	39
40	41	42	43	44	45	46	47
48	49	50	51	52	53	54	55
56	57	58	59	60	61	62	63

Make a set of these cards and you can tell the age of any one up to 63.

How to use them: Suppose a boy is 9 years old. Ask him if his age is on card A. He will answer "yes." Is it on card B? No. On card C? No. Card D? Yes. Card E? No. Card F? No. He has answered "yes" to cards A and D. Then add the *first numbers* on these two cards together $1+8=9$. You can tell him that he is 9 years old.

These cards can be used for a number game. I have a number in mind. Is it on card A? Yes. Card B? Yes. Card C? No. Card D? No. Card E? No. Card F? Yes. Then the number is the sum of the *first numbers* on these three cards, 1, 2, and 32. What is it?

These cards may also be used for addition by adding the various columns on each card.

EXERCISE IN ADDITION

Add from the bottom up:

1. 7825
6997
8672
6707
8948

2. 5359
5985
8937
7199
2655

3. 8862
9638
4965
5467
6399

4. 2438
7746
9925
3961
1492

5. 7988
6608
6765
8715
9287

6. 5371
5453
9889
7418
5799

7. 6977
6619
5939
9954
2636

8. 5569
8905
6558
4483
4687

9. 6774
6608
3918
7996
4598

10. 7328
7745
4906
4359
8969

11. 7554
7887
5965
3787
8965

12. 9684
7083
8698
4286
4789

13. 6687
6995
5977
7457
7558

14. 1629
3818
8243
9779
6474

15. 2173
8857
9679
7753
5949

16. 4498
9669
9678
5847
5979

17. 7682
8948
7698
6895
9948

18. 9956
3971
8698
8769
5575

19. 1279
5381
9658
4589
3464

20. 5626
7147
8855
4877
2738

AEROPLANES



1. The cost of six aeroplanes without fittings was as follows: \$20,900; \$13,462; \$14,368; \$10,490; \$30,244, and \$25,260. What was the total cost of the six aeroplanes?

2. The fittings for these aeroplanes cost the following amounts: \$2918; \$3641; \$1250; \$896; \$3248; and \$6291. Find the total cost of the fittings for the six aeroplanes.

3. Find the total cost of the six aeroplanes including the fittings.

4. On these six aeroplanes were the following number of fittings: 214, 618, 212, 308, 224, and 159. Find the total number of fittings on the six aeroplanes.

5. An aviator used in various flights in a certain week the following amounts of gasoline: 188 gallons; 154 gallons; 219 gallons; 213 gallons; 199 gallons; 151 gallons. How many gallons did he use in all the flights?

6. In building a certain hangar the government used 6983 board feet of flooring, 9372 board feet of frame lumber, and 2938 board feet of finishing lumber. Find the total number of board feet of lumber used in building this hangar.

7. Commander Reed, the first to cross the Atlantic in an aeroplane, flew 1416 miles, 177 miles, and 944 miles. How many miles did he fly on the whole trip?

A hangar is a shed in which aeroplanes are kept when they are not in use.

EXERCISES FOR SPEED AND ACCURACY, ADDITION

Pupils should practice on these exercises until they can write all the answers to each exercise, correctly, in one of the following time limits:

Fourth Grade Time Limits:

Excellent: 3 minutes; *Good:* $3\frac{1}{2}$ minutes; *Fair:* 4 minutes.

Suggestions to Teachers

Two methods of timing may be used: (1) The teacher may select one of the time limits and require all of the pupils to finish the exercise in that time; (2) the teacher may use all three time limits, announcing 3 minutes, $3\frac{1}{2}$ minutes, and 4 minutes. Have the pupils who have finished stand as the various times are announced. The last plan recognizes individual differences in pupils and stimulates the rapid pupils as well as the slow ones. Every exercise should be accurately timed with a watch.

These exercises may be mimeographed so that the pupils can do the work on the paper with the examples. Most of the exercises can be done by placing a strip of paper on the page of the book just below the examples and writing the answers on the strip of paper. A strip of paper may be folded into as many strips as there are rows of examples in the exercise and unfolded as successive rows of answers are written.

These speed exercises may be used in two ways: (1) The whole class may work on the same exercise and a record be kept of each pupil's results; (2) all pupils may begin with Exercise 1. Pupils who finish Exercise 1 correctly may go on with Exercise 2 at the next practice, and so on. After a pupil has failed to finish an exercise in 4 trials, it is best to let him go on and return to the unfinished exercise at a later date.

If a pupil is unable to finish an exercise in one of the three time limits indicated after 4 trials, the teacher should have him go over the exercise orally at a private conference so that the difficulties of the pupil may be determined and proper help be given to overcome these difficulties. Mere practice without intelligent assistance on the part of the teacher will not accomplish the best results.

Work for 100% accuracy in all of these exercises.

Exercise 1

<u>2</u>	<u>4</u>	<u>9</u>	<u>0</u>	<u>5</u>	<u>6</u>	<u>9</u>	<u>1</u>	<u>2</u>	<u>6</u>
<u>1</u>	<u>8</u>	<u>6</u>	<u>1</u>	<u>5</u>	<u>5</u>	<u>2</u>	<u>6</u>	<u>7</u>	<u>8</u>
<u>0</u>	<u>1</u>	<u>2</u>	<u>9</u>	<u>8</u>	<u>6</u>	<u>7</u>	<u>5</u>	<u>9</u>	<u>5</u>
<u>2</u>	<u>5</u>	<u>6</u>	<u>3</u>	<u>1</u>	<u>2</u>	<u>9</u>	<u>4</u>	<u>9</u>	<u>7</u>
<u>0</u>	<u>4</u>	<u>3</u>	<u>8</u>	<u>7</u>	<u>3</u>	<u>8</u>	<u>3</u>	<u>5</u>	<u>4</u>
<u>3</u>	<u>5</u>	<u>8</u>	<u>7</u>	<u>1</u>	<u>3</u>	<u>5</u>	<u>2</u>	<u>3</u>	<u>9</u>
<u>1</u>	<u>5</u>	<u>9</u>	<u>1</u>	<u>3</u>	<u>8</u>	<u>0</u>	<u>2</u>	<u>5</u>	<u>3</u>
<u>9</u>	<u>6</u>	<u>4</u>	<u>3</u>	<u>5</u>	<u>9</u>	<u>4</u>	<u>2</u>	<u>2</u>	<u>8</u>
<u>6</u>	<u>7</u>	<u>8</u>	<u>0</u>	<u>1</u>	<u>6</u>	<u>7</u>	<u>5</u>	<u>8</u>	<u>5</u>
<u>1</u>	<u>2</u>	<u>3</u>	<u>5</u>	<u>2</u>	<u>6</u>	<u>6</u>	<u>1</u>	<u>2</u>	<u>9</u>
<u>4</u>	<u>4</u>	<u>7</u>	<u>2</u>	<u>7</u>	<u>6</u>	<u>4</u>	<u>6</u>	<u>2</u>	<u>0</u>
<u>1</u>	<u>6</u>	<u>4</u>	<u>3</u>	<u>7</u>	<u>3</u>	<u>4</u>	<u>4</u>	<u>9</u>	<u>6</u>
<u>1</u>	<u>2</u>	<u>9</u>	<u>4</u>	<u>3</u>	<u>4</u>	<u>1</u>	<u>7</u>	<u>6</u>	<u>3</u>
<u>1</u>	<u>4</u>	<u>5</u>	<u>4</u>	<u>7</u>	<u>7</u>	<u>8</u>	<u>7</u>	<u>7</u>	<u>4</u>
<u>0</u>	<u>7</u>	<u>9</u>	<u>3</u>	<u>8</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>9</u>	<u>8</u>
<u>7</u>	<u>3</u>	<u>5</u>	<u>1</u>	<u>4</u>	<u>8</u>	<u>6</u>	<u>8</u>	<u>1</u>	<u>8</u>
<u>8</u>	<u>9</u>	<u>9</u>	<u>4</u>	<u>8</u>	<u>3</u>	<u>5</u>	<u>4</u>	<u>6</u>	<u>1</u>
<u>0</u>	<u>5</u>	<u>7</u>	<u>3</u>	<u>8</u>	<u>6</u>	<u>0</u>	<u>2</u>	<u>9</u>	<u>7</u>
<u>3</u>	<u>9</u>	<u>9</u>	<u>2</u>	<u>2</u>	<u>7</u>	<u>1</u>	<u>2</u>	<u>7</u>	<u>6</u>
<u>9</u>	<u>9</u>	<u>0</u>	<u>2</u>	<u>8</u>	<u>5</u>	<u>4</u>	<u>5</u>	<u>9</u>	<u>7</u>

If any pupil is unable to finish this exercise in the required time, the teacher should have him give the results orally, write down the combinations which cause the pupil difficulty, and then drill on these combinations. Successful work in addition depends very largely on a thorough mastery of these facts and adding by endings.

EXERCISES FOR PRACTICE, ADDITION

Exercise 2

4	6	7	2	2	6	5	7	1	0	3	4
2	5	3	5	2	2	4	2	7	1	3	4
7	3	3	9	7	3	4	6	7	4	6	8
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
6	1	5	9	8	4	2	6	1	3	1	6
1	8	3	5	0	3	1	3	5	2	1	0
7	9	9	1	4	5	9	2	8	8	8	4
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
2	4	7	1	6	7	2	8	4	3	1	8
3	3	1	1	0	2	4	0	5	5	3	1
5	7	8	9	6	7	8	5	1	9	9	6
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
4	5	1	2	6	5	1	6	6	3	9	7
4	0	5	2	2	2	2	3	1	3	9	3
7	6	7	7	2	5	8	3	4	4	4	9
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>

Exercise 3

6	4	7	3	9	4	6	3	2	1	1
2	3	5	7	3	2	3	2	2	2	3
3	8	5	4	7	8	8	6	7	5	5
4	0	7	9	6	4	9	8	5	2	0
9	8	8	3	5	8	4	2	7	7	9
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
6	9	1	4	5	9	6	7	5	7	7
6	1	1	2	4	6	1	6	3	5	5
5	6	7	8	8	0	7	6	2	6	6
1	1	5	7	3	6	9	2	8	7	7
5	9	8	9	4	5	9	7	8	5	5
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>

All of the exercises in addition have been prepared to add *downward*. If they are added upward a different emphasis is put upon the frequency of the various combinations. Insist that the pupils add downward in these exercises. They may check their results by adding upward.

Exercise 4

9	4	3	4	2	2	9	4	6	8	2
9	4	3	3	2	1	9	9	8	2	7
1	3	8	5	6	1	5	2	4	9	6
7	4	0	3	9	7	3	7	8	8	3
<u>6</u>	<u>9</u>	<u>9</u>	<u>8</u>	<u>3</u>	<u>1</u>	<u>5</u>	<u>9</u>	<u>6</u>	<u>9</u>	<u>3</u>

7	6	4	7	2	1	3	5	6	5
8	7	8	4	6	6	5	5	9	9
4	6	5	8	5	5	6	2	7	9
5	3	7	1	7	5	7	2	7	3
<u>3</u>	<u>4</u>	<u>6</u>	<u>3</u>	<u>5</u>	<u>9</u>	<u>3</u>	<u>6</u>	<u>3</u>	<u>6</u>

Exercise 5

42	16	28	69	82	37	33	94
<u>89</u>	<u>78</u>	<u>97</u>	<u>99</u>	<u>94</u>	<u>76</u>	<u>85</u>	<u>43</u>

53	76	65	36	93	95	36	43
<u>73</u>	<u>89</u>	<u>62</u>	<u>83</u>	<u>57</u>	<u>54</u>	<u>72</u>	<u>62</u>

72	52	85	94	78	29	34	45
<u>72</u>	<u>58</u>	<u>75</u>	<u>64</u>	<u>56</u>	<u>98</u>	<u>49</u>	<u>79</u>

85	64	82	84	87	83	57	59
<u>73</u>	<u>75</u>	<u>85</u>	<u>32</u>	<u>24</u>	<u>46</u>	<u>62</u>	<u>69</u>

42	68	43	52	91	70	11	28
<u>66</u>	<u>32</u>	<u>33</u>	<u>53</u>	<u>71</u>	<u>75</u>	<u>91</u>	<u>20</u>

EXERCISES FOR PRACTICE, ADDITION

Exercise 6

84	36	57	29	33	65	78	41
92	43	75	47	69	33	59	85
49	84	79	88	78	83	66	36
18	99	39	24	73	64	58	43
96	47	46	98	73	77	68	75
75	42	88	89	96	78	44	76

Exercise 7

6	7	2	9	5	6	7	3	7	7	6
4	6	1	9	7	9	1	1	9	5	7
5	9	8	5	8	4	3	7	8	7	3
9	9	9	5	5	7	1	2	8	9	1
4	5	4	7	3	3	2	7	9	5	7
1	6	8	7	8	8	9	3	8	3	8
4	4	6	6	8	2	2	3	5	6	3
4	5	9	8	1	3	5	9	2	8	8

Exercise 8

72	59	66	18	33	67	15	75
35	89	95	56	53	71	57	98
87	65	71	78	40	68	96	49
63	28	74	39	47	55	22	83
98	95	64	54	17	69	97	45

Exercise 9

24	49	37	78	73	48	97	65
84	16	37	63	55	75	79	89
97	41	19	91	79	34	68	68
79	34	89	75	99	58	77	55
63	55	11	77	98	44	97	38
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>

Exercise 10

89	57	75	22	28
58	35	85	72	79
94	37	87	68	55
88	86	18	36	48
24	66	10	13	79
63	93	29	59	94
97	36	43	55	93
55	42	47	36	68
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>

Exercise 11

7	2	4	8	4	3	5	9
9	4	5	6	8	7	2	8
5	7	4	4	3	2	8	9
7	5	6	5	9	2	8	7
3	9	2	3	6	9	9	6
2	5	4	1	1	8	9	9
9	6	5	8	3	1	7	2
7	8	4	1	7	7	6	6
5	9	3	6	8	1	8	9
1	2	7	8	9	6	3	7
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>

FOURTH YEAR

EXERCISES FOR PRACTICE, ADDITION

Exercise 12

24	97	92	79	18
17	99	68	73	54
64	51	79	37	76
65	95	55	39	78
87	99	92	55	96
42	88	79	83	72
92	61	53	87	26
<u>61</u>	<u>56</u>	<u>96</u>	<u>24</u>	<u>38</u>

Exercise 13

355	647	258	124	348
677	384	185	646	993
894	908	257	157	973
901	199	649	891	369
<u>786</u>	<u>786</u>	<u>558</u>	<u>779</u>	<u>925</u>

Exercise 14

7	3	4	2	7	3	8	9
7	5	3	7	5	5	3	9
2	6	3	2	5	2	4	8
6	1	6	2	8	9	8	6
6	6	9	9	9	6	4	3
7	3	9	4	8	5	4	4
7	6	4	8	6	4	5	8
1	3	5	9	9	7	5	7
5	3	9	6	6	1	3	9
<u>8</u>	<u>1</u>	<u>7</u>	<u>7</u>	<u>7</u>	<u>9</u>	<u>6</u>	<u>3</u>

Exercise 15

756	694	773	116	669
875	135	598	797	857
794	485	656	972	598
991	466	736	942	947
<u>786</u>	<u>794</u>	<u>885</u>	<u>824</u>	<u>899</u>

Exercise 16

5467	8759	2856	4934
5976	8988	2678	7087
9893	3597	9568	6233
4065	9815	6086	6963
<u>5417</u>	<u>4934</u>	<u>2849</u>	<u>9713</u>

Exercise 17

3	7	2	4	5	8	9
4	7	3	9	6	5	8
5	4	3	3	3	8	3
9	8	2	6	7	7	3
0	7	6	1	1	7	9
4	6	9	9	7	5	5
8	7	4	6	6	6	5
7	8	1	4	9	7	3
9	2	5	2	8	6	9
8	1	2	9	4	7	5
2	8	4	8	8	1	2
<u>9</u>	<u>1</u>	<u>7</u>	<u>8</u>	<u>6</u>	<u>9</u>	<u>2</u>

FOURTH YEAR

EXERCISES FOR PRACTICE, ADDITION

Exercise 18

6989	3976	8698	4356
7519	5787	4699	5367
8878	7195	8749	3999
7964	1654	2425	9587
<u>3580</u>	<u>1789</u>	<u>9283</u>	<u>7786</u>

Exercise 19

783	816	238
696	739	893
584	464	681
359	377	769
575	471	579
736	237	548
828	284	756
864	599	169
<u>623</u>	<u>798</u>	<u>773</u>

Exercise 20

6745	3667	7354
7565	8643	5454
6070	5080	9270
8775	9150	7280
5984	5921	8777
6190	9382	9290
6870	9832	8680
<u>9820</u>	<u>1390</u>	<u>8979</u>

EXERCISES FOR PRACTICE

Subtract 5347–2846.

5347 Minuend
 2846 Subtrahend
 2501 Remainder

Just as we need names for people so that we know who is meant when a person is mentioned, we also need names for the different parts of a subtraction problem.

We must all use the same names for the different numbers or we should get confused. For a great many years the following names have been used: The *minuend* is the number from which another number has been subtracted; the *subtrahend* is the number that is subtracted or taken away; the *remainder* is the number that is left after the subtrahend is taken from the minuend. The remainder may also be defined as the number which added to the subtrahend will make the minuend. (See pages 93 and 97 for explanations for subtraction.)

Subtract:

1.	2.	3.	4.	5.	6.	7.	8.	9.
<u>73</u>	<u>75</u>	<u>81</u>	<u>63</u>	<u>74</u>	<u>97</u>	<u>93</u>	<u>92</u>	<u>54</u>
<u>49</u>	<u>36</u>	<u>38</u>	<u>38</u>	<u>29</u>	<u>28</u>	<u>64</u>	<u>15</u>	<u>46</u>

10.	11.	12.	13.	14.	15.	16.
<u>925</u>	<u>836</u>	<u>907</u>	<u>645</u>	<u>723</u>	<u>455</u>	<u>924</u>
<u>339</u>	<u>249</u>	<u>539</u>	<u>287</u>	<u>125</u>	<u>258</u>	<u>498</u>

17.	18.	19.	20.	21.	22.	23.
<u>642</u>	<u>533</u>	<u>942</u>	<u>511</u>	<u>956</u>	<u>921</u>	<u>1000</u>
<u>473</u>	<u>396</u>	<u>617</u>	<u>164</u>	<u>800</u>	<u>767</u>	<u>423</u>

24.	25.	26.	27.	28.	29.
<u>9800</u>	<u>8194</u>	<u>9616</u>	<u>7972</u>	<u>8818</u>	<u>5100</u>
<u>1542</u>	<u>5497</u>	<u>5178</u>	<u>6758</u>	<u>8150</u>	<u>2899</u>

SUBTRACTION PROBLEMS



1. Ruth measured 53 inches, and Helen measured 49 inches. How many inches taller was Ruth than Helen?

2. Bertha measured her schoolroom. It was 30 feet long and 24 feet wide. It was how many feet longer than it was wide?

3. Ellen bought groceries amounting to \$3.26. She handed the clerk a \$5.00 bill. How much change did she receive?

4. Alice bought dress goods amounting to \$2.35. She gave the clerk \$3.00. How much change should she receive?

5. Albert sold \$35.80 worth of vegetables from his garden plot. His expenses were \$8.35. How much did he clear on his garden plot?

6. A third-grade class gave an entertainment and cleared \$39.75. The fourth-grade class of the same school worked hard to beat them. They cleared \$42.50. How much did they beat the third grade?

7. The grocery bill of a family of four was \$31.47 for September and \$34.62 for October. How much more did they spend during October than during September?

8. The meat bill of the same family was \$11.73 for September and \$10.95 for October. How much less was the meat bill for October?

9. Find the difference between 500 and 275.

10. A farmer raised 2125 bushels of corn and sold 1250 bushels. How many bushels did he have left?

11. Mr. Davis had \$455 in the bank and drew out \$197. How much did he have left in the bank?

12. Ethel had \$12.56 in her bank account and drew out \$1.75 to pay for her school books. How much did she have left?

13. Arthur bought 2 pigs for \$22.50. He spent \$14.25 for feed. How much did the pigs and feed cost him? He sold them for \$59.70. What was his profit on the 2 pigs?

14. Washington's Monument is 556 feet high. The Eiffel Tower in Paris is 984 feet high. How much higher is the Eiffel Tower than Washington's Monument?

15. The Mississippi River is 3160 miles long. The Colorado River is about 1600 miles long. How much longer is the Mississippi than the Colorado?

16. It is 3258 miles from Boston to London and 3423 miles from New York to London. How much farther is it from New York to London?

17. A merchant bought potatoes for \$1.25 per bushel and sold them at \$1.60 per bushel. Find his profit per bushel.

18. Ruth saved \$1.74 out of her monthly allowance, which her mother gave her, while her sister saved only \$1.29. How much more did Ruth save than her sister?

19. Ethel bought groceries amounting to \$1.38. She handed the clerk \$2.00 in payment. How much change should she receive?

STORE PROBLEMS

If you should purchase the following articles and should hand the storekeeper \$1.00 in payment each time, what amount of change would you receive? Do as many of these problems mentally as you can:

1. A fourth reader, 40 cents.
2. A pocket knife, 85 cents.
3. Fish hooks, rod, and line, 65 cents.
4. Pair of ice skates, 95 cents.
5. A dozen oranges, 45 cents.
6. A box of candy, 60 cents.

Paying for each of the following purchases with a \$2.00 bill, you will receive what amount in change?

7. Bananas, 60 cents.
8. Ribbon, \$1.62.
9. Sugar, \$1.05.
10. Lemons, \$.75.
11. Cheese, \$1.45.
12. Napkin rings, \$1.90.

Paying for each of the following purchases with a \$5.00 bill, you will receive what amount in change?

13. A student lamp for \$3.60.
14. A rocking chair for \$4.25.
15. A baseball, bat, and glove for \$3.75.
16. A doll and doll carriage for \$4.60.
17. An order of groceries amounting to \$3.57.
18. A pair of ball-bearing roller skates, \$1.95.
19. Dress goods amounting to \$2.65.
20. A mirror, costing \$3.75.
21. A turkey, costing \$4.29.

(Made by a Real Boy)

May 1	Bal. brought forward	75	May 1	Hair cut	25
4	Work in garden	30	3	Street car fare	05
8	Caring for chickens	25	4	Map.	01
12	2 hrs. work in garden	20	14	Car tickets	1 00
15	Running errands	05	17	Candy	02
17	Digging dandelions	35	23	Sunday school	10
19		15	31	Pencil	05
24	Weeding garden	25	31	Candy	02
29	Caring for chickens	25			
June 1	Bal. brought forward				

1. What was Jack's income during the month of May as shown by his cash account?

2. How much money did he spend during the month?

3. What is his "balance brought forward" June 1?

The *balance brought forward* is found by subtracting the sum of the amounts paid out from the sum of the amounts received.

4. During the month of June Jack's account was as follows: *Received*—June 3, cutting lawn, 25c; June 12, caring for chickens, 25c; June 19, picking strawberries, 50c; June 26, work in garden, 40c; June 29, cutting lawn, 25c.

Paid Out—June 18, tennis shoes, 75c; tennis balls, 60c.

Arrange this account in the form he used for his May account and find his "balance brought forward" July 1.

5. Keep a cash account of your receipts and expenses for a month. Or if you prefer, make out an imaginary cash account and balance it.

EXERCISES FOR SPEED AND ACCURACY, SUBTRACTION

Exercise 1

$\begin{array}{r} 4 \\ 2 \\ \hline \end{array}$	$\begin{array}{r} 5 \\ 3 \\ \hline \end{array}$	$\begin{array}{r} 10 \\ 6 \\ \hline \end{array}$	$\begin{array}{r} 11 \\ 7 \\ \hline \end{array}$	$\begin{array}{r} 14 \\ 6 \\ \hline \end{array}$	$\begin{array}{r} 10 \\ 8 \\ \hline \end{array}$	$\begin{array}{r} 12 \\ 6 \\ \hline \end{array}$	$\begin{array}{r} 11 \\ 4 \\ \hline \end{array}$	$\begin{array}{r} 11 \\ 6 \\ \hline \end{array}$	$\begin{array}{r} 17 \\ 9 \\ \hline \end{array}$	$\begin{array}{r} 8 \\ 8 \\ \hline \end{array}$	$\begin{array}{r} 6 \\ 1 \\ \hline \end{array}$
$\begin{array}{r} 9 \\ 3 \\ \hline \end{array}$	$\begin{array}{r} 18 \\ 9 \\ \hline \end{array}$	$\begin{array}{r} 17 \\ 8 \\ \hline \end{array}$	$\begin{array}{r} 13 \\ 4 \\ \hline \end{array}$	$\begin{array}{r} 8 \\ 6 \\ \hline \end{array}$	$\begin{array}{r} 12 \\ 8 \\ \hline \end{array}$	$\begin{array}{r} 8 \\ 3 \\ \hline \end{array}$	$\begin{array}{r} 10 \\ 2 \\ \hline \end{array}$	$\begin{array}{r} 4 \\ 1 \\ \hline \end{array}$	$\begin{array}{r} 6 \\ 5 \\ \hline \end{array}$	$\begin{array}{r} 15 \\ 9 \\ \hline \end{array}$	$\begin{array}{r} 7 \\ 4 \\ \hline \end{array}$
$\begin{array}{r} 14 \\ 7 \\ \hline \end{array}$	$\begin{array}{r} 9 \\ 6 \\ \hline \end{array}$	$\begin{array}{r} 16 \\ 7 \\ \hline \end{array}$	$\begin{array}{r} 6 \\ 4 \\ \hline \end{array}$	$\begin{array}{r} 10 \\ 5 \\ \hline \end{array}$	$\begin{array}{r} 11 \\ 9 \\ \hline \end{array}$	$\begin{array}{r} 9 \\ 4 \\ \hline \end{array}$	$\begin{array}{r} 14 \\ 9 \\ \hline \end{array}$	$\begin{array}{r} 5 \\ 4 \\ \hline \end{array}$	$\begin{array}{r} 8 \\ 1 \\ \hline \end{array}$	$\begin{array}{r} 12 \\ 5 \\ \hline \end{array}$	$\begin{array}{r} 4 \\ 4 \\ \hline \end{array}$
$\begin{array}{r} 8 \\ 5 \\ \hline \end{array}$	$\begin{array}{r} 8 \\ 7 \\ \hline \end{array}$	$\begin{array}{r} 15 \\ 7 \\ \hline \end{array}$	$\begin{array}{r} 9 \\ 1 \\ \hline \end{array}$	$\begin{array}{r} 12 \\ 9 \\ \hline \end{array}$	$\begin{array}{r} 9 \\ 2 \\ \hline \end{array}$	$\begin{array}{r} 10 \\ 9 \\ \hline \end{array}$	$\begin{array}{r} 16 \\ 9 \\ \hline \end{array}$	$\begin{array}{r} 6 \\ 3 \\ \hline \end{array}$	$\begin{array}{r} 12 \\ 7 \\ \hline \end{array}$	$\begin{array}{r} 9 \\ 7 \\ \hline \end{array}$	$\begin{array}{r} 6 \\ 0 \\ \hline \end{array}$
$\begin{array}{r} 3 \\ 1 \\ \hline \end{array}$	$\begin{array}{r} 6 \\ 2 \\ \hline \end{array}$	$\begin{array}{r} 11 \\ 3 \\ \hline \end{array}$	$\begin{array}{r} 13 \\ 6 \\ \hline \end{array}$	$\begin{array}{r} 8 \\ 2 \\ \hline \end{array}$	$\begin{array}{r} 4 \\ 3 \\ \hline \end{array}$	$\begin{array}{r} 13 \\ 9 \\ \hline \end{array}$	$\begin{array}{r} 10 \\ 1 \\ \hline \end{array}$	$\begin{array}{r} 12 \\ 4 \\ \hline \end{array}$	$\begin{array}{r} 10 \\ 4 \\ \hline \end{array}$	$\begin{array}{r} 13 \\ 5 \\ \hline \end{array}$	$\begin{array}{r} 7 \\ 3 \\ \hline \end{array}$
$\begin{array}{r} 9 \\ 8 \\ \hline \end{array}$	$\begin{array}{r} 11 \\ 2 \\ \hline \end{array}$	$\begin{array}{r} 7 \\ 0 \\ \hline \end{array}$	$\begin{array}{r} 13 \\ 8 \\ \hline \end{array}$	$\begin{array}{r} 16 \\ 8 \\ \hline \end{array}$	$\begin{array}{r} 5 \\ 1 \\ \hline \end{array}$	$\begin{array}{r} 13 \\ 7 \\ \hline \end{array}$	$\begin{array}{r} 7 \\ 2 \\ \hline \end{array}$	$\begin{array}{r} 12 \\ 3 \\ \hline \end{array}$	$\begin{array}{r} 11 \\ 5 \\ \hline \end{array}$	$\begin{array}{r} 15 \\ 6 \\ \hline \end{array}$	$\begin{array}{r} 3 \\ 2 \\ \hline \end{array}$
$\begin{array}{r} 10 \\ 7 \\ \hline \end{array}$	$\begin{array}{r} 7 \\ 1 \\ \hline \end{array}$	$\begin{array}{r} 11 \\ 8 \\ \hline \end{array}$	$\begin{array}{r} 5 \\ 2 \\ \hline \end{array}$	$\begin{array}{r} 15 \\ 8 \\ \hline \end{array}$	$\begin{array}{r} 7 \\ 6 \\ \hline \end{array}$	$\begin{array}{r} 9 \\ 5 \\ \hline \end{array}$	$\begin{array}{r} 14 \\ 8 \\ \hline \end{array}$	$\begin{array}{r} 10 \\ 3 \\ \hline \end{array}$	$\begin{array}{r} 8 \\ 4 \\ \hline \end{array}$	$\begin{array}{r} 14 \\ 5 \\ \hline \end{array}$	$\begin{array}{r} 7 \\ 5 \\ \hline \end{array}$

Exercise 2

$\begin{array}{r} 19 \\ 7 \\ \hline \end{array}$	$\begin{array}{r} 36 \\ 9 \\ \hline \end{array}$	$\begin{array}{r} 31 \\ 8 \\ \hline \end{array}$	$\begin{array}{r} 27 \\ 3 \\ \hline \end{array}$	$\begin{array}{r} 44 \\ 6 \\ \hline \end{array}$	$\begin{array}{r} 19 \\ 4 \\ \hline \end{array}$	$\begin{array}{r} 59 \\ 2 \\ \hline \end{array}$	$\begin{array}{r} 53 \\ 7 \\ \hline \end{array}$	$\begin{array}{r} 22 \\ 7 \\ \hline \end{array}$	$\begin{array}{r} 38 \\ 4 \\ \hline \end{array}$	$\begin{array}{r} 43 \\ 5 \\ \hline \end{array}$	$\begin{array}{r} 66 \\ 5 \\ \hline \end{array}$
$\begin{array}{r} 57 \\ 9 \\ \hline \end{array}$	$\begin{array}{r} 32 \\ 3 \\ \hline \end{array}$	$\begin{array}{r} 62 \\ 6 \\ \hline \end{array}$	$\begin{array}{r} 88 \\ 8 \\ \hline \end{array}$	$\begin{array}{r} 24 \\ 5 \\ \hline \end{array}$	$\begin{array}{r} 79 \\ 6 \\ \hline \end{array}$	$\begin{array}{r} 41 \\ 7 \\ \hline \end{array}$	$\begin{array}{r} 30 \\ 3 \\ \hline \end{array}$	$\begin{array}{r} 66 \\ 3 \\ \hline \end{array}$	$\begin{array}{r} 50 \\ 7 \\ \hline \end{array}$	$\begin{array}{r} 36 \\ 7 \\ \hline \end{array}$	$\begin{array}{r} 61 \\ 2 \\ \hline \end{array}$
$\begin{array}{r} 43 \\ 6 \\ \hline \end{array}$	$\begin{array}{r} 99 \\ 8 \\ \hline \end{array}$	$\begin{array}{r} 44 \\ 3 \\ \hline \end{array}$	$\begin{array}{r} 28 \\ 9 \\ \hline \end{array}$	$\begin{array}{r} 76 \\ 2 \\ \hline \end{array}$	$\begin{array}{r} 70 \\ 4 \\ \hline \end{array}$	$\begin{array}{r} 54 \\ 8 \\ \hline \end{array}$	$\begin{array}{r} 28 \\ 3 \\ \hline \end{array}$	$\begin{array}{r} 41 \\ 4 \\ \hline \end{array}$	$\begin{array}{r} 38 \\ 5 \\ \hline \end{array}$	$\begin{array}{r} 64 \\ 9 \\ \hline \end{array}$	$\begin{array}{r} 86 \\ 6 \\ \hline \end{array}$

See page 178 for time limits and suggestions for using these exercises.

EXERCISES FOR PRACTICE, SUBTRACTION 193

Exercise 3

<u>43</u> <u>4</u>	<u>39</u> <u>3</u>	<u>53</u> <u>9</u>	<u>41</u> <u>3</u>	<u>28</u> <u>2</u>	<u>67</u> <u>8</u>	<u>97</u> <u>2</u>	<u>51</u> <u>9</u>	<u>25</u> <u>3</u>	<u>30</u> <u>9</u>	<u>75</u> <u>9</u>	<u>60</u> <u>6</u>
<u>44</u> <u>7</u>	<u>16</u> <u>4</u>	<u>33</u> <u>8</u>	<u>52</u> <u>5</u>	<u>67</u> <u>2</u>	<u>45</u> <u>6</u>	<u>28</u> <u>6</u>	<u>42</u> <u>4</u>	<u>39</u> <u>9</u>	<u>20</u> <u>2</u>	<u>85</u> <u>8</u>	<u>35</u> <u>2</u>
<u>55</u> <u>7</u>	<u>31</u> <u>6</u>	<u>19</u> <u>5</u>	<u>36</u> <u>8</u>	<u>61</u> <u>5</u>	<u>45</u> <u>5</u>	<u>32</u> <u>8</u>	<u>30</u> <u>8</u>	<u>57</u> <u>6</u>	<u>38</u> <u>7</u>	<u>44</u> <u>4</u>	<u>54</u> <u>6</u>

Exercise 4

<u>97</u> <u>47</u>	<u>92</u> <u>47</u>	<u>98</u> <u>60</u>	<u>71</u> <u>23</u>	<u>92</u> <u>54</u>	<u>93</u> <u>20</u>	<u>87</u> <u>69</u>	<u>82</u> <u>53</u>	<u>45</u> <u>37</u>
<u>94</u> <u>35</u>	<u>95</u> <u>30</u>	<u>84</u> <u>18</u>	<u>35</u> <u>19</u>	<u>61</u> <u>38</u>	<u>65</u> <u>14</u>	<u>94</u> <u>10</u>	<u>96</u> <u>27</u>	<u>63</u> <u>28</u>
<u>90</u> <u>11</u>	<u>83</u> <u>24</u>	<u>74</u> <u>49</u>	<u>90</u> <u>50</u>	<u>35</u> <u>28</u>	<u>66</u> <u>19</u>	<u>71</u> <u>32</u>	<u>92</u> <u>80</u>	<u>42</u> <u>29</u>

Exercise 5

<u>435</u> <u>156</u>	<u>347</u> <u>268</u>	<u>723</u> <u>597</u>	<u>811</u> <u>364</u>	<u>900</u> <u>612</u>	<u>989</u> <u>679</u>
<u>551</u> <u>280</u>	<u>823</u> <u>479</u>	<u>791</u> <u>196</u>	<u>814</u> <u>147</u>	<u>919</u> <u>310</u>	<u>956</u> <u>406</u>
<u>950</u> <u>169</u>	<u>379</u> <u>197</u>	<u>963</u> <u>594</u>	<u>756</u> <u>297</u>	<u>675</u> <u>597</u>	

EXERCISES FOR PRACTICE, SUBTRACTION

Exercise 6

8233	9391	6413	5742	9831	7565
<u>2678</u>	<u>5373</u>	<u>2765</u>	<u>3894</u>	<u>2052</u>	<u>1486</u>
9584	9482	9341	8510	8921	7123
<u>2885</u>	<u>7073</u>	<u>3968</u>	<u>3727</u>	<u>5949</u>	<u>4476</u>

Exercise 7

56240	51212	57510	57230	84792
<u>18017</u>	<u>21538</u>	<u>15691</u>	<u>16583</u>	<u>14916</u>
85096	94030	94265	95831	53526
<u>74830</u>	<u>92508</u>	<u>36279</u>	<u>43630</u>	<u>18037</u>

Exercise 8

93344	73561	61345	92385	84287
<u>61459</u>	<u>27887</u>	<u>46950</u>	<u>58605</u>	<u>27380</u>
82236	62485	98489	91518	99296
<u>56959</u>	<u>24986</u>	<u>78092</u>	<u>24729</u>	<u>85208</u>

Exercise 9

812130	826364	951349	943147
<u>315387</u>	<u>117789</u>	<u>386360</u>	<u>684059</u>
762325	953276	823427	934399
<u>164729</u>	<u>154397</u>	<u>385798</u>	<u>169936</u>

Find the following *products*:

<u>11</u>	<u>11</u>	<u>11</u>	<u>11</u>	<u>11</u>	<u>11</u>	<u>11</u>	<u>11</u>	<u>11</u>	<u>11</u>
<u>11</u>	<u>10</u>	<u>7</u>	<u>2</u>	<u>5</u>	<u>9</u>	<u>3</u>	<u>8</u>	<u>6</u>	<u>4</u>
<u>10</u>	<u>3</u>	<u>5</u>	<u>8</u>	<u>2</u>	<u>9</u>	<u>6</u>	<u>4</u>	<u>7</u>	<u>1</u>
<u>11</u>	<u>11</u>	<u>11</u>	<u>11</u>	<u>11</u>	<u>11</u>	<u>11</u>	<u>11</u>	<u>11</u>	<u>11</u>

Have the pupils use addition, as in the tables in third-grade work, to find any products which they do not know.

Eleven 2's = ?	Eleven 6's = ?
Eleven 9's = ?	Eleven 4's = ?
Eleven 5's = ?	Eleven 7's = ?
Eleven 8's = ?	Eleven 3's = ?
Eleven 10's = ?	Eleven 11's = ?

Supply the missing numbers in these multiplication facts:

$11 \times ? = 33$	$11 \times ? = 99$	$11 \times ? = 55$
$11 \times ? = 77$	$11 \times ? = 66$	$11 \times ? = 110$
$11 \times ? = 22$	$11 \times ? = 44$	$11 \times ? = 121$

1. Find the cost of 11 bars of candy at 7 cents each.

2. How much will 11 oranges cost at 5 cents each?

3. What will 3 movie tickets cost at 11 cents each?

4. Find the cost of 11 bars of soap at 8 cents each.

Fill in the following multiplication table:

$11 \times 2 = ?$	$11 \times 7 = ?$	$2 \times 11 = ?$	$7 \times 11 = ?$
$11 \times 3 = ?$	$11 \times 8 = ?$	$3 \times 11 = ?$	$8 \times 11 = ?$
$11 \times 4 = ?$	$11 \times 9 = ?$	$4 \times 11 = ?$	$9 \times 11 = ?$
$11 \times 5 = ?$	$11 \times 10 = ?$	$5 \times 11 = ?$	$10 \times 11 = ?$
$11 \times 6 = ?$	$11 \times 11 = ?$	$6 \times 11 = ?$	$11 \times 11 = ?$

MULTIPLICATION BY 12

Find the following products, using addition if necessary:

$$\begin{array}{r} 12 \\ 2 \end{array} \quad \begin{array}{r} 12 \\ 7 \end{array} \quad \begin{array}{r} 12 \\ 2 \end{array} \quad \begin{array}{r} 12 \\ 9 \end{array} \quad \begin{array}{r} 12 \\ 5 \end{array} \quad \begin{array}{r} 12 \\ 10 \end{array} \quad \begin{array}{r} 12 \\ 4 \end{array} \quad \begin{array}{r} 12 \\ 12 \end{array} \quad \begin{array}{r} 12 \\ 6 \end{array} \quad \begin{array}{r} 12 \\ 8 \end{array}$$

$$\begin{array}{r} 12 \\ 11 \end{array} \quad \begin{array}{r} 5 \\ 12 \end{array} \quad \begin{array}{r} 9 \\ 12 \end{array} \quad \begin{array}{r} 2 \\ 12 \end{array} \quad \begin{array}{r} 7 \\ 12 \end{array} \quad \begin{array}{r} 3 \\ 12 \end{array} \quad \begin{array}{r} 8 \\ 12 \end{array} \quad \begin{array}{r} 6 \\ 12 \end{array} \quad \begin{array}{r} 4 \\ 12 \end{array} \quad \begin{array}{r} 11 \\ 12 \end{array}$$

How many inches are there in a foot?

Change the following to inches:

- | | | | |
|-------------|-------------|------------|--------------|
| 1. 1 ft. = | 4. 8 ft. = | 7. 4 ft. = | 10. 5 ft. = |
| 2. 7 ft. = | 5. 6 ft. = | 8. 3 ft. = | 11. 12 ft. = |
| 3. 11 ft. = | 6. 10 ft. = | 9. 2 ft. = | 12. 9 ft. = |

A dozen is equal to 12 things.

The following number of dozens are equal to how many things?

- | | | | |
|--------------|-------------|-------------|---------------|
| 1. 1 doz. = | 4. 5 doz. = | 7. 6 doz. = | 10. 7 doz. = |
| 2. 8 doz. = | 5. 3 doz. = | 8. 2 doz. = | 11. 12 doz. = |
| 3. 10 doz. = | 6. 4 doz. = | 9. 9 doz. = | 12. 11 doz. = |

A year is equal to 12 months.

Change the following numbers of years to months:

- | | | | |
|------------|------------|-------------|--------------|
| 1. 1 yr. = | 4. 7 yr. = | 7. 4 yr. = | 10. 10 yr. = |
| 2. 5 yr. = | 5. 3 yr. = | 8. 6 yr. = | 11. 8 yr. = |
| 3. 2 yr. = | 6. 9 yr. = | 9. 12 yr. = | 12. 11 yr. = |

Make a table for the 12's like the one on page 195.

Supply the missing numbers:

$\begin{array}{r} 12 \\ ? \end{array}$	$\begin{array}{r} 8 \\ 12 \end{array}$	$\begin{array}{r} ? \\ 12 \end{array}$	$\begin{array}{r} 11 \\ 12 \end{array}$	$\begin{array}{r} 12 \\ ? \end{array}$	$\begin{array}{r} ? \\ 12 \end{array}$	$\begin{array}{r} 12 \\ ? \end{array}$	$\begin{array}{r} 12 \\ 12 \end{array}$	$\begin{array}{r} ? \\ 12 \end{array}$	$\begin{array}{r} 12 \\ ? \end{array}$
60	?	72	?	36	120	108	?	84	48

ORAL MULTIPLICATION PROBLEMS

1. Five dozen eggs and 6 more are —— eggs?
2. If I send 11 packages by parcel post, and each package must have 8 cents in stamps on it, what will the stamps cost for all of the packages?
3. A gardener set out 9 rows of strawberry plants with 11 plants in each row. How many plants did he have in his strawberry bed?
4. Twelve things make a dozen and 12 dozen make a gross. If a hardware dealer says a box of screws contains a gross, you will know that there are how many?
5. A clerk saves \$12 a month from his salary. How much does he save in 6 months?
6. A telegraph operator sent 11 telegrams of 10 words each. How many words were in the telegrams?
7. In Mr. Jones's orchard there are 6 rows of trees with 12 trees in each row. How many trees are there in his orchard?
8. At \$10 a month what does a clerk pay for the rent of his room for a year?
9. There are 4 dozen stars on our flag. These represent how many states?
10. How much will it cost to send 12 packages by parcel post at 9 cents each?
11. A teacher bought 3 dozen post cards to give one to each pupil in her room. How many pupils did she have in her room?

BUYING FRUITS AND GROCERIES

Copy each of the following accounts and write the product of each item in the columns opposite. At the bottom of each column give the total amount.

A fruit vendor sold to a hotel the following fruits at the prices stated:

	\$	cts.
1. 2 dozen bananas at \$.35 a dozen		
2. 3 dozen plums at \$.30 a dozen		
3. 2 dozen lemons at \$.35 a dozen		
4. 3 dozen oranges at \$.50 a dozen		
5. 6 pineapples at \$.25 each		
6. What was the total cost of the fruit?		

The children in Roberta's school gave a picnic. For this picnic the "supply committee" bought:

	\$	cts.
1. 3 lbs. ginger wafers at \$.25 a lb.		
2. 4 pkgs. of crackers at \$.15 per pkg.		
3. 3 lbs. of cheese at \$.40 a lb.		
4. 6 tins of sardines at \$.20 per tin		
5. 5 lbs. of "mixed" candy at \$.30 per lb.		
6. What was the total cost of these supplies?		

A groceryman shipped the following cereals by parcel post to an out-of-town customer:

	\$	cts.
1. 5 pkgs. Quaker Oats at \$.10 per pkg.		
2. 3 pkgs. Wheatena at \$.20 per pkg.		
3. 6 pkgs. Cream of Wheat at \$.25 per pkg.		
4. 3 pkgs. Grape Nuts at \$.15 per pkg.		
5. 4 pkgs. Shredded Wheat at \$.15 per pkg.		
6. 2 pkgs. Puffed Rice at \$.15 per pkg.		
7. 4 pkgs. Puffed Wheat at \$.15 per pkg.		
8. 3 pkgs. Post Toasties at \$.15 per pkg.		
9. What was the total charge for these goods?		

MULTIPLICATION

199

MULTIPLICATION REVIEW

1. 814 <u>9</u>	2. 625 <u>3</u>	3. 368 <u>7</u>	4. 784 <u>2</u>	5. 592 <u>8</u>	6. 714 <u>5</u>	7. 916 <u>6</u>
8. 258 <u>4</u>	9. 417 <u>8</u>	10. 290 <u>5</u>	11. 259 <u>7</u>	12. 817 <u>3</u>	13. 704 <u>6</u>	14. 619 <u>2</u>
15. 690 <u>9</u>	16. 407 <u>4</u>	17. 718 <u>7</u>	18. 527 <u>2</u>	19. 835 <u>6</u>	20. 916 <u>4</u>	21. 860 <u>8</u>
22. 725 <u>9</u>	23. 358 <u>5</u>	24. 904 <u>3</u>	25. 537 <u>8</u>	26. 739 <u>4</u>	27. 637 <u>3</u>	28. 839 <u>9</u>
29. 724 <u>7</u>	30. 289 <u>6</u>	31. 869 <u>2</u>	32. 647 <u>5</u>	33. 964 <u>1</u>	34. 426 <u>4</u>	35. 968 <u>8</u>
36. 985 <u>3</u>	37. 534 <u>2</u>	38. 736 <u>9</u>	39. 598 <u>5</u>	40. 639 <u>7</u>	41. 736 <u>6</u>	42. 590 <u>7</u>
43. 834 <u>8</u>	44. 967 <u>9</u>	45. 548 <u>6</u>	46. 746 <u>7</u>	47. 736 <u>8</u>	48. 845 <u>9</u>	49. 937 <u>6</u>
50. 894 <u>5</u>	51. 789 <u>4</u>	52. 897 <u>3</u>	53. 698 <u>2</u>	54. 528 <u>7</u>	55. 576 <u>5</u>	56. 459 <u>8</u>

REVIEW PROBLEMS

1. There are 12 months in a year. How many months has a girl lived who has just reached her 9th birthday?

2. Find the cost of 3 dozen bananas at \$.45 a dozen.

3. Grace's mother gave her a sample of some dress goods priced at \$1.35 a yard and told her to buy 7 yards of it. How much money did she need to pay for it?

4. How much will it cost to buy 9 baseball suits for a team at \$5.75 each?

5. Find the cost of a set of 6 dining chairs at \$4.75 each.

6. A young woman who works in a factory pays \$6.75 per week for room and board. How much does she pay for room and board in 4 weeks?

7. George sold 8 of his best Leghorn hens at \$1.75 each. How much did he receive for them?

8. Find the cost of 4 bushels of peaches at \$2.75 a bushel.

9. How much will 3 barrels of apples cost at \$6.75 a barrel?

10. Elmer earned \$1.25 per day during 6 days of his spring vacation. How much did he receive for his 6 days' work?

11. Lucille bought 6 pounds of frankforts for a class picnic. How much did they cost at \$.24 per pound?

12. Find the cost of a 7-pound roast at \$.28 a pound.

13. Find the cost of 3 dozen eggs at \$.43 a dozen.

PRACTICE PROBLEMS IN MULTIPLICATION 201

1. 3680 <u>7</u>	2. 8246 <u>2</u>	3. 8472 <u>5</u>	4. 5308 <u>9</u>	5. 6219 <u>6</u>	6. 5471 <u>4</u>
7. 6284 <u>8</u>	8. 7319 <u>3</u>	9. 9217 <u>9</u>	10. 3629 <u>4</u>	11. 4087 <u>6</u>	12. 5420 <u>3</u>
13. 2547 <u>7</u>	14. 5639 <u>5</u>	15. 3157 <u>8</u>	16. 7391 <u>2</u>	17. 6489 <u>9</u>	18. 7601 <u>5</u>
19. 9164 <u>7</u>	20. 8740 <u>4</u>	21. 5362 <u>6</u>	22. 5078 <u>2</u>	23. 7609 <u>8</u>	24. 8637 <u>3</u>
25. 8537 <u>1</u>	26. 4275 <u>9</u>	27. 8527 <u>7</u>	28. 4958 <u>8</u>	29. 8734 <u>6</u>	30. 2954 <u>5</u>
31. 8326 <u>8</u>	32. 9315 <u>7</u>	33. 6849 <u>9</u>	34. 8319 <u>5</u>	35. 6538 <u>4</u>	36. 9583 <u>6</u>
37. 7634 <u>9</u>	38. 4970 <u>8</u>	39. 9807 <u>7</u>	40. 9648 <u>3</u>	41. 9597 <u>4</u>	42. 9796 <u>6</u>
43. 9376 <u>3</u>	44. 9364 <u>7</u>	45. 9375 <u>8</u>	46. 7253 <u>9</u>	47. 9348 <u>4</u>	48. 4698 <u>2</u>

MULTIPLICATION WITH A TWO-FIGURE MULTIPLIER

$$10 \times 4 = ? \quad 10 \times 8 = ? \quad 10 \times 9 = ? \quad 10 \times 3 = ?$$

$$10 \times 6 = ? \quad 10 \times 2 = ? \quad 10 \times 7 = ? \quad 10 \times 5 = ?$$

What figure do you notice in each product?

Can you tell an easy way to multiply a number by 10?

Multiply:

$$10 \times 34 = ? \quad 10 \times 85 = ? \quad 10 \times 79 = ? \quad 10 \times 50 = ?$$

$$10 \times 28 = ? \quad 10 \times 63 = ? \quad 10 \times 40 = ? \quad 10 \times 92 = ?$$

Read the products of these numbers multiplied by 10:

1. 98	3. 125	5. 340	7. 760	9. 208
2. 60	4. 239	6. 709	8. 495	10. 121

If necessary, give more examples to show ~~that~~ *that an easy way to multiply by 10 is to annex a zero to the number that is multiplied.*

WRITTEN MULTIPLICATION

1. There are 32 quarts in a bushel. How many quarts are there in 14 bushels of onion sets? In 14 bushels there are 14×32 quarts or — quarts.

Explanation: $14 = 10 + 4$. Multiplying 32 by 14 is the same as first multiplying it by 4, then by 10 and adding the two products:

$$\begin{array}{r} 32 \\ 14 \\ \hline 128 = 4 \times 32 \\ 320 = 10 \times 32 \\ \hline 448 = 14 \times 32 \end{array}$$

This form may be shortened to the one shown at the right.

$$\begin{array}{r} 32 \\ 14 \\ \hline 128 \\ 32 \\ \hline 448 \end{array}$$

Show that the first figure (2) in the partial product obtained from the tens' figure of the multiplier falls in the tens' column of the partial product.

Multiply

2. 15 <u>97</u>	3. 87 <u>47</u>	4. 49 <u>63</u>	5. 65 <u>28</u>	6. 23 <u>19</u>	7. 48 <u>58</u>	8. 96 <u>49</u>	9. 57 <u>63</u>
10. 98 <u>62</u>	11. 47 <u>89</u>	12. 94 <u>47</u>	13. 29 <u>85</u>	14. 68 <u>63</u>	15. 35 <u>54</u>	16. 76 <u>75</u>	17. 13 <u>68</u>
18. 48 <u>79</u>	19. 74 <u>42</u>	20. 23 <u>37</u>	21. 67 <u>69</u>	22. 78 <u>58</u>	23. 52 <u>46</u>	24. 98 <u>93</u>	25. 59 <u>87</u>
26. 26 <u>28</u>	27. 30 <u>68</u>	28. 59 <u>25</u>	29. 13 <u>32</u>	30. 86 <u>71</u>	31. 73 <u>89</u>	32. 89 <u>36</u>	33. 46 <u>79</u>
34. 76 <u>63</u>	35. 58 <u>49</u>	36. 38 <u>82</u>	37. 79 <u>94</u>	38. 64 <u>38</u>	39. 46 <u>45</u>	40. 59 <u>57</u>	41. 53 <u>69</u>
42. 95 <u>38</u>	43. 48 <u>92</u>	44. 70 <u>45</u>	45. 59 <u>71</u>	46. 89 <u>86</u>	47. 48 <u>37</u>	48. 56 <u>39</u>	49. 32 <u>37</u>

50. A yard is 36 inches. How many inches in 20 yards? In 20 yards there are 20×36 inches or _____ inches.¹

51. A pound = 16 ounces. 40 pounds equal how many ounces? 40×16 ounces = ? ounces.

52. $60 \times 24 = ?$ **53.** $40 \times 36 = ?$ **54.** $90 \times 74 = ?$

36 ¹ Explain in this way: $20 = 2 \times 10$. Then to multiply by 20 is just the same as finding 2×10 times 36. $10 \times 36 = 360$. $2 \times 360 = 720$. Then show shorter form at left.

PROBLEMS IN MULTIPLICATION

1. What is the rent of a house for 12 months at \$25 a month?
2. What is the rent of a flat for 12 months at \$45 a month?
3. A teacher's salary is \$135 a month for a term of 9 months. What is her salary for the whole term?
4. A school board bought 28 new desks for the school at \$4.75 each. What did these new desks cost?
5. Gerald sold 24 cabbages to a grocer at \$.15 each. How much did he receive for them?
6. A mail carrier drives 28 miles per day. How many miles does he drive in 6 days?
7. A fourth-grade class gave an entertainment and charged \$.25 admission. The ticket seller sold 97 tickets. How much money did he receive?
8. Gertrude's mother bought 15 dozen eggs at \$.38 a dozen to pack for winter. How much did she pay for them?
9. Mr. Brown bought 15 bushels of potatoes to store for the winter at \$1.35 per bushel. How much did he pay for them?
10. How much will a fruit dealer receive for a box of 64 grapefruit at \$.12 each?
11. How much will a fruit dealer receive for a crate of 16 boxes of strawberries at \$.35 a box?
12. Find the cost of a 12-pound turkey at \$.42 a pound.

13. A bushel of wheat weighs 60 pounds. How much does a load of 46 bushels weigh?

14. A farmer had a yield of 24 bushels of wheat per acre from a field of 26 acres. How many bushels did he get from the whole field?

15. A stock dealer bought 56 calves at an average cost of \$28 each. How much did the whole drove cost him?

16. Find the cost of an 80-acre farm at \$175 per acre.

17. How much will the rent on a garage amount to in a year (12 months) at \$3.50 per month?

18. A dealer bought 45 pounds of butter at \$.56 a pound. How much did he pay for the butter?

19. A merchant ordered 34 tons of coal at \$10.75 a ton. How much was his coal bill?

20. A truck driver charged 20 children \$.50 each to take them on a picnic. How much did he receive for the trip?

21. A family used 59 quarts of milk one month. Figure their milk bill for that month at \$.12 a quart.

22. Walter worked for a neighbor, during vacation, at \$.15 an hour. One week he worked 37 hours. How much did he receive for that week's work?

23. Find the cost of 4 tires for an automobile at \$45 each.

24. A bale of cotton weighs 500 pounds. How many pounds are there in 16 such bales?

25. Find the total weight of a carload of 95 hogs at 245 pounds each.



SELLING HOUSEHOLD SUPPLIES.

The sales of Dale's grocery and market on a Saturday included the following household supplies:

62 dozen eggs @ \$.38
means 62 dozen eggs at 38
cents a dozen.

Find the total amount of the sales of each item.

1.	Butter	37 lbs.	Riverside Creamery	@	\$0.59
2.	Eggs	62 doz.	"Strictly fresh" country	@	.38
3.	Cheese	19 lbs.	American	@	.40
4.	Bread	82 loaves	"Mother's"	@	.10
5.	Crackers	21 lbs.	Soda Premium	@	.22
6.	Apples	120 lbs.	Maiden Blush	@	.08
7.	Peaches	23 bas.	Freestone	@	.55
8.	Pears	5 "	Bartlett	@	.45
9.	Plums	3 "	Michigan	@	.48
10.	Grapes	19 "	Concord	@	.40
11.	Tomatoes	16 "		@	.35
12.	Potatoes	96 lb.	Virginia	@	.03
13.	Onions	12 "	White	@	.05
14.	Beets	16 "		@	.05
15.	Turnips	17 "	Yellowsaps	@	.05
16.	Parsnips	14 "	Marrowfat	@	.05
17.	Carrots	10 "		@	.03
18.	Chickens	60 "		@	.32
19.	Turkeys	24 "		@	.38
20.	Ducks	26 "	Mallard	@	.28
21.	Geese	28 "	Watertown	@	.27

THREE-FIGURE MULTIPLIERS

1. Multiply 9854 by 258; by 208; by 260.

$$\begin{array}{r} 9854 \\ 258 \\ \hline 78832 \\ 49270 \\ 19708 \\ \hline 2,542,332 \end{array}$$

$$\begin{array}{r} 9854 \\ 208 \\ \hline 78832 \\ 19708 \\ \hline 2,049,632 \end{array}$$

$$\begin{array}{r} 9854 \\ 260 \\ \hline 591240 \\ 19708 \\ \hline 2,562,040 \end{array}$$

In multiplying by the *units'* figure of the multiplier put the first figure of the partial product in *units'* column; in multiplying by the *tens'* figure put the first figure of that partial product in *tens'* column; in multiplying by the *hundreds'* figure put the first figure of the partial product in *hundreds'* column. In a problem with a zero in *tens'* place, it is not necessary to write down a row of zeros in the *tens'* partial product—merely put the first figure of the *hundreds'* partial product in *hundreds'* column. If there is a zero in *units'* place in the multiplier, a zero must be placed in *units'* place of the first partial product and then the *tens'* figure obtained by multiplying by the figure in *tens'* place of the multiplier.

$$\begin{array}{r} 2. \quad 8451 \\ 237 \\ \hline \end{array}$$

$$\begin{array}{r} 3. \quad 6392 \\ 840 \\ \hline \end{array}$$

$$\begin{array}{r} 4. \quad 5708 \\ 956 \\ \hline \end{array}$$

$$\begin{array}{r} 5. \quad 4625 \\ 438 \\ \hline \end{array}$$

$$\begin{array}{r} 6. \quad 6923 \\ 657 \\ \hline \end{array}$$

$$\begin{array}{r} 7. \quad 6719 \\ 409 \\ \hline \end{array}$$

$$\begin{array}{r} 8. \quad 8970 \\ 813 \\ \hline \end{array}$$

$$\begin{array}{r} 9. \quad 7084 \\ 405 \\ \hline \end{array}$$

$$\begin{array}{r} 10. \quad 7632 \\ 278 \\ \hline \end{array}$$

$$\begin{array}{r} 11. \quad 5148 \\ 761 \\ \hline \end{array}$$

$$\begin{array}{r} 12. \quad 4238 \\ 390 \\ \hline \end{array}$$

$$\begin{array}{r} 13. \quad 1084 \\ 768 \\ \hline \end{array}$$

$$\begin{array}{r} 14. \quad 3659 \\ 809 \\ \hline \end{array}$$

$$\begin{array}{r} 15. \quad 8017 \\ 848 \\ \hline \end{array}$$

$$\begin{array}{r} 16. \quad 9263 \\ 576 \\ \hline \end{array}$$

$$\begin{array}{r} 17. \quad 8709 \\ 932 \\ \hline \end{array}$$

THREE-FIGURE MULTIPLIERS

18. 7509 867	19. 8548 495	20. 3976 703	21. 9854 826
22. 8293 380	23. 9275 976	24. 5697 485	25. 8364 629
26. 8364 957	27. 4756 863	28. 7259 597	29. 8349 248
30. 9765 932	31. 8567 970	32. 4968 867	33. 7389 408
34. 7538 768	35. 9346 750	36. 8275 960	37. 5836 709

SCHOOL STORE INVENTORY



The children whose store you see on page 84 made an inventory of their stock. Find the value of the goods of each kind and also the total value of the goods in the store.

I. *Breakfast Foods:*

21 boxes Corn Flakes.....	@	.10
13 " Krumbles.....	@	.15
9 " Wheatena.....	@	.18
12 " Shredded Wheat.....	@	.15
5 " Post Toasties.....	@	.15
7 " Cream of Wheat.....	@	.25

II. *Canned and Bottled Goods:*

10 cans Campbell's Soup.....	@	\$.10
6 " Hawaiian Pineapple.....	@	.25
4 " " ".....	@	.35

8	Cans Green Peas.....	@	\$.18
13	" Tomatoes.....	@	.25
9	" Baked Beans.....	@	.20
15	" Corn.....	@	.18
8	bottles Olives.....	@	.35
4	" Catsup.....	@	.25
12	" Flavoring Extract.....	@	.20

III. *Cocoa, Tea, Coffee, Chocolate, etc.:*

13	one-pound cans Coffee.....	@	\$.55
9	" " Tea.....	@	.65
8	" " Cocoa.....	@	.50
5	small cans Cocoa.....	@	.25
15	one-half pound bars Chocolate.....	@	.25

IV. *Milk, Butter, Eggs, etc.:*

15	one-pound package Creamery Butter.....	@	\$.59
1	five-pound crock Dairy Butter.....	@	.50
12	one-dozen pkg. Selected Eggs.....	@	.42
9	quart bottles Milk.....	@	.14
8	pint bottles Milk.....	@	.07

V. *Miscellaneous:*

4	boxes Domino Sugar.....	@	\$.44
12	pounds Granulated Sugar.....	@	.11
9	boxes Dromedary Dates.....	@	.15
4	packages Seeded Raisins.....	@	.18
3	boxes Minute Tapioca.....	@	.15
4	sacks Flour.....	@	1.80
1	bushel Potatoes.....	@	1.60
8	cans Dutch Cleanser.....	@	.15
6	Brooms.....	@	1.25

As reference to pages 84 and 85 shows, the articles listed in this inventory were for the most part represented by the empty cans, bottles, or boxes which had held them.

EXERCISES FOR SPEED AND ACCURACY, MULTIPLICATION

Exercise 1

<u>9</u> <u>4</u>	<u>4</u> <u>2</u>	<u>7</u> <u>4</u>	<u>2</u> <u>2</u>	<u>3</u> <u>3</u>	<u>7</u> <u>9</u>	<u>7</u> <u>5</u>	<u>9</u> <u>6</u>	<u>6</u> <u>0</u>	<u>7</u> <u>7</u>	<u>8</u> <u>4</u>
<u>7</u> <u>1</u>	<u>2</u> <u>9</u>	<u>5</u> <u>9</u>	<u>5</u> <u>6</u>	<u>0</u> <u>3</u>	<u>4</u> <u>9</u>	<u>7</u> <u>3</u>	<u>6</u> <u>3</u>	<u>8</u> <u>5</u>	<u>6</u> <u>7</u>	<u>2</u> <u>8</u>
<u>1</u> <u>8</u>	<u>6</u> <u>9</u>	<u>8</u> <u>3</u>	<u>1</u> <u>9</u>	<u>5</u> <u>5</u>	<u>4</u> <u>8</u>	<u>4</u> <u>4</u>	<u>6</u> <u>6</u>	<u>3</u> <u>4</u>	<u>8</u> <u>2</u>	<u>1</u> <u>3</u>
<u>2</u> <u>6</u>	<u>5</u> <u>8</u>	<u>9</u> <u>0</u>	<u>6</u> <u>5</u>	<u>7</u> <u>8</u>	<u>6</u> <u>1</u>	<u>9</u> <u>2</u>	<u>6</u> <u>8</u>	<u>1</u> <u>5</u>	<u>9</u> <u>7</u>	<u>5</u> <u>3</u>
<u>7</u> <u>6</u>	<u>8</u> <u>9</u>	<u>3</u> <u>7</u>	<u>0</u> <u>2</u>	<u>2</u> <u>7</u>	<u>9</u> <u>5</u>	<u>4</u> <u>3</u>	<u>0</u> <u>5</u>	<u>2</u> <u>3</u>	<u>3</u> <u>8</u>	<u>2</u> <u>7</u>
<u>6</u> <u>2</u>	<u>3</u> <u>6</u>	<u>5</u> <u>7</u>	<u>3</u> <u>9</u>	<u>5</u> <u>4</u>	<u>0</u> <u>4</u>	<u>3</u> <u>2</u>	<u>9</u> <u>3</u>	<u>4</u> <u>5</u>	<u>9</u> <u>8</u>	<u>8</u> <u>0</u>
<u>4</u> <u>7</u>	<u>2</u> <u>5</u>	<u>8</u> <u>7</u>	<u>4</u> <u>6</u>	<u>9</u> <u>9</u>	<u>3</u> <u>5</u>	<u>4</u> <u>2</u>	<u>8</u> <u>8</u>	<u>5</u> <u>2</u>	<u>6</u> <u>4</u>	<u>8</u> <u>6</u>

Exercise 2

<u>28</u> <u>3</u>	<u>36</u> <u>7</u>	<u>93</u> <u>9</u>	<u>24</u> <u>4</u>	<u>80</u> <u>5</u>	<u>75</u> <u>8</u>	<u>79</u> <u>6</u>	<u>85</u> <u>2</u>	<u>65</u> <u>5</u>
<u>80</u> <u>9</u>	<u>96</u> <u>3</u>	<u>26</u> <u>6</u>	<u>49</u> <u>2</u>	<u>19</u> <u>8</u>	<u>57</u> <u>7</u>	<u>38</u> <u>6</u>	<u>64</u> <u>8</u>	<u>73</u> <u>3</u>
<u>47</u> <u>5</u>	<u>56</u> <u>9</u>	<u>61</u> <u>4</u>	<u>67</u> <u>2</u>	<u>80</u> <u>7</u>	<u>40</u> <u>3</u>	<u>14</u> <u>9</u>	<u>49</u> <u>7</u>	<u>38</u> <u>8</u>

See page 178 for time limits for these exercises.

EXERCISES FOR PRACTICE, MULTIPLICATION 211

Exercise 3

$\begin{array}{r} 29 \\ \underline{5} \end{array}$	$\begin{array}{r} 45 \\ \underline{6} \end{array}$	$\begin{array}{r} 57 \\ \underline{4} \end{array}$	$\begin{array}{r} 27 \\ \underline{9} \end{array}$	$\begin{array}{r} 70 \\ \underline{6} \end{array}$	$\begin{array}{r} 27 \\ \underline{8} \end{array}$	$\begin{array}{r} 93 \\ \underline{4} \end{array}$	$\begin{array}{r} 42 \\ \underline{7} \end{array}$	$\begin{array}{r} 39 \\ \underline{5} \end{array}$
$\begin{array}{r} 80 \\ \underline{6} \end{array}$	$\begin{array}{r} 72 \\ \underline{9} \end{array}$	$\begin{array}{r} 19 \\ \underline{7} \end{array}$	$\begin{array}{r} 89 \\ \underline{8} \end{array}$	$\begin{array}{r} 39 \\ \underline{6} \end{array}$	$\begin{array}{r} 96 \\ \underline{2} \end{array}$	$\begin{array}{r} 58 \\ \underline{4} \end{array}$	$\begin{array}{r} 68 \\ \underline{3} \end{array}$	$\begin{array}{r} 9 \\ \underline{9} \end{array}$
$\begin{array}{r} 65 \\ \underline{7} \end{array}$	$\begin{array}{r} 57 \\ \underline{5} \end{array}$	$\begin{array}{r} 34 \\ \underline{8} \end{array}$	$\begin{array}{r} 70 \\ \underline{4} \end{array}$	$\begin{array}{r} 84 \\ \underline{9} \end{array}$	$\begin{array}{r} 79 \\ \underline{3} \end{array}$	$\begin{array}{r} 61 \\ \underline{6} \end{array}$	$\begin{array}{r} 56 \\ \underline{8} \end{array}$	$\begin{array}{r} 87 \\ \underline{7} \end{array}$

Exercise 4

$\begin{array}{r} 489 \\ \underline{6} \end{array}$	$\begin{array}{r} 908 \\ \underline{8} \end{array}$	$\begin{array}{r} 578 \\ \underline{5} \end{array}$	$\begin{array}{r} 629 \\ \underline{3} \end{array}$	$\begin{array}{r} 942 \\ \underline{7} \end{array}$	$\begin{array}{r} 905 \\ \underline{4} \end{array}$
$\begin{array}{r} 529 \\ \underline{9} \end{array}$	$\begin{array}{r} 920 \\ \underline{2} \end{array}$	$\begin{array}{r} 386 \\ \underline{7} \end{array}$	$\begin{array}{r} 493 \\ \underline{5} \end{array}$	$\begin{array}{r} 438 \\ \underline{3} \end{array}$	$\begin{array}{r} 308 \\ \underline{9} \end{array}$
$\begin{array}{r} 476 \\ \underline{9} \end{array}$	$\begin{array}{r} 847 \\ \underline{4} \end{array}$	$\begin{array}{r} 736 \\ \underline{8} \end{array}$	$\begin{array}{r} 321 \\ \underline{6} \end{array}$	$\begin{array}{r} 175 \\ \underline{7} \end{array}$	

Exercise 5

$\begin{array}{r} 2735 \\ \underline{7} \end{array}$	$\begin{array}{r} 4981 \\ \underline{5} \end{array}$	$\begin{array}{r} 9730 \\ \underline{8} \end{array}$	$\begin{array}{r} 6573 \\ \underline{4} \end{array}$	$\begin{array}{r} 5387 \\ \underline{9} \end{array}$
$\begin{array}{r} 9468 \\ \underline{2} \end{array}$	$\begin{array}{r} 7509 \\ \underline{3} \end{array}$	$\begin{array}{r} 5389 \\ \underline{6} \end{array}$	$\begin{array}{r} 5628 \\ \underline{8} \end{array}$	$\begin{array}{r} 7365 \\ \underline{5} \end{array}$
	$\begin{array}{r} 9648 \\ \underline{7} \end{array}$	$\begin{array}{r} 2489 \\ \underline{4} \end{array}$	$\begin{array}{r} 1249 \\ \underline{9} \end{array}$	

EXERCISES FOR PRACTICE, MULTIPLICATION

Exercise 6

<u>2156</u> 6	<u>7260</u> 6	<u>4368</u> 3	<u>8974</u> 8	<u>8950</u> 7
<u>5084</u> 9	<u>8394</u> 6	<u>8795</u> 4	<u>9386</u> 3	<u>1604</u> 8
	<u>7235</u> 8	<u>4162</u> 7	<u>4658</u> 5	

Exercise 7

<u>36</u> 80	<u>57</u> 40	<u>18</u> 20	<u>92</u> 50	<u>74</u> 90	<u>63</u> 70	<u>59</u> 60
<u>21</u> 80	<u>74</u> 60	<u>58</u> 90	<u>30</u> 40	<u>21</u> 70	<u>69</u> 30	<u>78</u> 50
<u>95</u> 70	<u>80</u> 48	<u>96</u> 90	<u>75</u> 80	<u>74</u> 70	<u>34</u> 90	<u>89</u> 80

Exercise 8

<u>46</u> 38	<u>93</u> 72	<u>39</u> 96	<u>27</u> 57	<u>71</u> 29	<u>90</u> 70	<u>41</u> 86	<u>60</u> 13	<u>68</u> 78	<u>58</u> 42
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Exercise 9

<u>93</u> 65	<u>62</u> 91	<u>53</u> 85	<u>75</u> 73	<u>64</u> 95	<u>94</u> 83	<u>75</u> 40	<u>40</u> 62	<u>59</u> 51	<u>70</u> 84
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EXERCISES FOR PRACTICE, MULTIPLICATION 213

Exercise 10

<u>76</u>	<u>86</u>	<u>21</u>	<u>61</u>	<u>92</u>	<u>80</u>	<u>58</u>	<u>14</u>	<u>74</u>	<u>91</u>
<u>94</u>	<u>82</u>	<u>13</u>	<u>60</u>	<u>26</u>	<u>35</u>	<u>69</u>	<u>54</u>	<u>91</u>	<u>37</u>

Exercise 11

<u>57</u>	<u>29</u>	<u>34</u>	<u>70</u>	<u>82</u>	<u>63</u>	<u>80</u>	<u>81</u>	<u>48</u>	<u>39</u>
<u>72</u>	<u>84</u>	<u>70</u>	<u>68</u>	<u>50</u>	<u>64</u>	<u>19</u>	<u>61</u>	<u>47</u>	<u>59</u>

Exercise 12

<u>461</u>	<u>380</u>	<u>257</u>	<u>502</u>	<u>418</u>	<u>936</u>
<u>38</u>	<u>59</u>	<u>62</u>	<u>17</u>	<u>64</u>	<u>49</u>

Exercise 13

<u>795</u>	<u>317</u>	<u>714</u>	<u>873</u>	<u>391</u>	<u>809</u>
<u>85</u>	<u>27</u>	<u>45</u>	<u>36</u>	<u>91</u>	<u>39</u>

Exercise 14

<u>529</u>	<u>386</u>	<u>42</u>	<u>578</u>	<u>468</u>	<u>851</u>
<u>67</u>	<u>89</u>	<u>47</u>	<u>19</u>	<u>52</u>	<u>87</u>

Exercise 15

<u>609</u>	<u>486</u>	<u>234</u>	<u>709</u>	<u>359</u>	<u>724</u>
<u>86</u>	<u>37</u>	<u>98</u>	<u>74</u>	<u>35</u>	<u>96</u>

FOURTH YEAR

EXERCISES FOR PRACTICE, MULTIPLICATION

Exercise 16

910	702	368	895	456	539
<u>92</u>	<u>38</u>	<u>67</u>	<u>84</u>	<u>39</u>	<u>38</u>

Exercise 17

5629	7216	9450
<u>964</u>	<u>378</u>	<u>325</u>

Exercise 18

4509	9486	2768
<u>847</u>	<u>607</u>	<u>745</u>

Exercise 19

8397	3014	5713
<u>378</u>	<u>947</u>	<u>528</u>

Exercise 20

7652	7381	8439
<u>994</u>	<u>629</u>	<u>852</u>

Exercise 21

83740	29561
<u>7483</u>	<u>495</u>



1. Fred, Ralph, and Frank earned \$1.20 cutting dandelions out of a lawn. How much did each receive if they divided the money equally?

2. A yard is equal to how many feet? A playground is 285 feet long and 189 feet wide. How many yards long is it? How many yards wide?

3. How many picture postals at 5 cents each can be bought for 85 cents; for 65 cents; for 95 cents?

4. Helen's mother gave her 38 cents to buy 2-cent stamps. How many should the postmaster give her for that amount?

5. What will $\frac{1}{3}$ yard of silk cost at \$2.50 a yard? What will $\frac{1}{2}$ yard of this silk cost?

6. At 8 cents a yard, how many yards of ribbon can be bought for 80 cents?

7. Four boys went on a camping trip. Their expenses amounted to \$9.68. They divided the expense equally. How much did each have to pay?

8. A fruit dealer emptied 3 boxes of grapefruit on the fruit stand. There were 192 in the 3 boxes. How many was that per box?

9. Elsie sold 4 quarts of strawberries from her patch for 72 cents. How much did she charge per quart?

Have the pupils supplement this list of problems with others, which they make up. *Real problems* obtained from their experiences or the transactions of their parents are of most value for this supplementary work.

DIVISION

10. A 2-pound box of chocolates cost \$1.30. How much was that per pound?

11. John set 90 tomato plants in 5 equal rows. How many plants did he have in each row?

12. Edwin's father paid \$1.40 for 5 gallons of gasoline. What was the price per gallon?

13. How many pecks are there in a bushel? When potatoes are selling for \$1.40 per bushel, what is the cost of a peck?

14. Find the cost of a peck of pears at \$1.80 a bushel.

15. Find the cost of $\frac{1}{4}$ pound of candy at 60 cents a pound.

16. If a butcher charges \$1.68 for a 6-pound roast, what is his price per pound?

17. Robert went to the store to buy a supply of lead pencils for the school store. He had \$1.65. How many pencils at 5 cents each could he buy for that amount?

18. There are 8 quarts in a peck. Ethel sold a peck of peas from her garden for 72 cents. How much did she receive per quart?

19. A farmer paid \$725 for 5 cows. What was the average cost per cow?

20. Marie paid \$3.15 for 9 yards of dress goods. How much did it cost per yard?

21. A sewing teacher bought 42 yards of muslin for her class to make aprons. How many aprons requiring 3 yards each could be made from this material?

SHORT DIVISION

Exercise 1

2) $\overline{4}$	9) $\overline{18}$	7) $\overline{28}$	8) $\overline{16}$	4) $\overline{20}$	8) $\overline{40}$	5) $\overline{25}$	6) $\overline{30}$
9) $\overline{54}$	8) $\overline{8}$	4) $\overline{24}$	9) $\overline{45}$	5) $\overline{15}$	3) $\overline{21}$	5) $\overline{35}$	6) $\overline{0}$
9) $\overline{9}$	5) $\overline{40}$	4) $\overline{4}$	2) $\overline{14}$	9) $\overline{36}$	5) $\overline{10}$	3) $\overline{3}$	8) $\overline{32}$
6) $\overline{12}$	5) $\overline{20}$	8) $\overline{64}$	7) $\overline{14}$	6) $\overline{18}$	4) $\overline{36}$	5) $\overline{0}$	3) $\overline{6}$
8) $\overline{48}$	2) $\overline{2}$	3) $\overline{15}$	9) $\overline{81}$	4) $\overline{16}$	7) $\overline{49}$	8) $\overline{24}$	4) $\overline{12}$
2) $\overline{6}$	7) $\overline{63}$	2) $\overline{12}$	7) $\overline{21}$	5) $\overline{45}$	4) $\overline{8}$	7) $\overline{35}$	6) $\overline{54}$
4) $\overline{0}$	6) $\overline{48}$	2) $\overline{8}$	7) $\overline{42}$	9) $\overline{72}$	2) $\overline{0}$	9) $\overline{27}$	3) $\overline{24}$
5) $\overline{5}$	2) $\overline{18}$	4) $\overline{28}$	2) $\overline{10}$	6) $\overline{36}$	8) $\overline{72}$	6) $\overline{6}$	2) $\overline{16}$
4) $\overline{32}$	7) $\overline{7}$	3) $\overline{18}$	7) $\overline{56}$	3) $\overline{0}$	6) $\overline{24}$	3) $\overline{27}$	3) $\overline{9}$
5) $\overline{30}$	9) $\overline{63}$	3) $\overline{12}$	6) $\overline{42}$	9) $\overline{0}$	8) $\overline{56}$		

Exercise 2

2) $\overline{430}$	5) $\overline{895}$	3) $\overline{171}$	2) $\overline{680}$	6) $\overline{474}$	5) $\overline{325}$
9) $\overline{756}$	4) $\overline{372}$	2) $\overline{196}$	8) $\overline{472}$	7) $\overline{588}$	3) $\overline{552}$
9) $\overline{468}$	7) $\overline{259}$	6) $\overline{888}$	3) $\overline{207}$	6) $\overline{390}$	4) $\overline{348}$

Exercise 3

9) $\overline{657}$	8) $\overline{672}$	5) $\overline{420}$	8) $\overline{504}$	7) $\overline{665}$	2) $\overline{152}$
3) $\overline{960}$	8) $\overline{576}$	4) $\overline{248}$	7) $\overline{434}$	9) $\overline{864}$	5) $\overline{160}$
6) $\overline{192}$	5) $\overline{450}$	9) $\overline{963}$	4) $\overline{200}$	8) $\overline{560}$	4) $\overline{164}$

See page 178 for time limits for these exercises.

EXERCISES FOR PRACTICE, SHORT DIVISION

Exercise 4

7) $\overline{3157}$

4) $\overline{3468}$

2) $\overline{1886}$

6) $\overline{5058}$

9) $\overline{9487}$

3) $\overline{2625}$

5) $\overline{4320}$

8) $\overline{2592}$

7) $\overline{5621}$

3) $\overline{2856}$

2) $\overline{1042}$

Exercise 5

8) $\overline{7688}$

5) $\overline{3755}$

9) $\overline{7758}$

6) $\overline{5802}$

2) $\overline{1578}$

4) $\overline{3740}$

7) $\overline{6832}$

8) $\overline{6800}$

9) $\overline{4590}$

3) $\overline{1239}$

5) $\overline{1150}$

Exercise 6

4) $\overline{39320}$

6) $\overline{51432}$

9) $\overline{71505}$

2) $\overline{17590}$

7) $\overline{62594}$

3) $\overline{29049}$

8) $\overline{29960}$

5) $\overline{49315}$

Exercise 7

3) $\overline{21642}$

7) $\overline{42091}$

6) $\overline{36318}$

8) $\overline{55848}$

5) $\overline{35215}$

9) $\overline{61488}$

4) $\overline{28260}$

6) $\overline{54084}$

Exercise 8

8) $\overline{778896}$

5) $\overline{394820}$

9) $\overline{849384}$

6) $\overline{521844}$

4) $\overline{315744}$

7) $\overline{689199}$

1. Divide 5832 by 8.

First form:

$$\begin{array}{r} 729 \\ 8 \overline{)5832} \end{array}$$

Second form:

$$\begin{array}{r} 729 \\ 8 \overline{)5832} \\ \underline{56} \\ 23 \\ \underline{16} \\ 72 \\ \underline{72} \\ 00 \end{array}$$

In dividing by short division we perform the work without writing down any of the work except the quotient. In dividing 5832 by 8, if you were to write down all the work that you do instead of working it orally, the problem would look like the second form. We call this second form *long division*. When we explain the different steps in a long-division problem, we find that we proceed as follows:

(1) You *divide* 58 by 8 and put the result (7) in the quotient directly over the 8 of the dividend.

(2) You *multiply* 7 times 8 and place the product, 56, under the 58 of the dividend.

(3) You *subtract* the 56 from the 58, leaving a remainder, 2.

(4) You *bring down*¹ the next figure (3) of the dividend and place it at the right of the 2, making 23.

¹Show that the 2 in the remainder of the long form represents the 2 remaining in the short-division problem and that the 3 is "brought down" in order to be annexed to the remainder just as the remainder 2 and the 3 are annexed mentally in the short form. Make constant reference to the short-division form in teaching the new form.

The purpose of outlining a short division problem so fully in the long division form is to make the pupil thoroughly familiar with the various *steps* involved in long division before he attempts to master the *new points* introduced by a long division problem with a *two-figure divisor*.

LONG DIVISION

(5) You *divide* 23 by 8 and place the result (2) in the quotient above the 3 of the dividend.

(6) You *multiply* 2 times 8 and write the 16 under the 23.

(7) You *subtract* the 16 from the 23, leaving a remainder of 7.

(8) You *bring down the next figure* (2) from the dividend and place it at the right of the 7 in the remainder, making 72.

(9) You *divide* 72 by 8 and place the result (9) in the quotient above the 2 of the dividend.

(10) You *multiply* 9 times 8 and write the product, 72, under the 72.

(11) You *subtract* 72 from 72, leaving *no* remainder.

These steps are always followed in working a long division problem: (1) *divide*, (2) *multiply*, (3) *subtract*, and (4) *bring down the next figure of the dividend*. These steps follow in regular order until all the figures in the dividend have been used.

Solve the following by the long-division form:

2. $1974 \div 2$

7. $4264 \div 8$

12. $5634 \div 9$

3. $2694 \div 3$

8. $6597 \div 9$

13. $7584 \div 6$

4. $2632 \div 4$

9. $5256 \div 6$

14. $3164 \div 7$

5. $3780 \div 5$

10. $9569 \div 7$

15. $5144 \div 8$

6. $2569 \div 7$

11. $2752 \div 8$

16. $4311 \div 9$

17. Nine girls went on a camping trip. Their total expense for the trip amounted to \$19.44. How much did each pay if the expenses were equally divided?

18. A real estate dealer sold 7 lots for \$4725. How much did he receive per lot?

The purpose of this exercise is merely to teach the form of long division. After the pupils get the form for use in problems with two-figure divisors, they should then be cautioned against using this form further with a one-figure divisor because short division is much more rapid.

DIVIDING BY MULTIPLES OF 10

Solve orally and compare the quotients:

- | | | | |
|--------------------|-------------------|---------------------|-------------------|
| 1. $4 \div 2 = ?$ | $40 \div 20 = ?$ | 6. $12 \div 2 = ?$ | $120 \div 20 = ?$ |
| 2. $6 \div 3 = ?$ | $60 \div 30 = ?$ | 7. $16 \div 8 = ?$ | $160 \div 80 = ?$ |
| 3. $2 \div 1 = ?$ | $20 \div 10 = ?$ | 8. $24 \div 6 = ?$ | $240 \div 60 = ?$ |
| 4. $10 \div 5 = ?$ | $100 \div 50 = ?$ | 9. $36 \div 9 = ?$ | $360 \div 90 = ?$ |
| 5. $15 \div 5 = ?$ | $150 \div 50 = ?$ | 10. $27 \div 3 = ?$ | $270 \div 30 = ?$ |

Show that in dividing a number by 20, 30, 40, or any other number of 10's, it is only necessary to find how many times the 2, 3, 4, 5, or other number of tens is contained times in the first one or two figures of the dividend in order to find the figure in the quotient.

Divide, using the long-division form:

1. $7280 \div 80$

$$\begin{array}{r} 91 \\ 80 \overline{) 7280} \\ \underline{720} \\ 80 \\ \underline{80} \\ 0 \end{array}$$
 To find the first figure of the quotient, divide 8 into 72. 8 is contained in 72, 9 times. Place the 9 in the quotient directly above the 8. $9 \times 80 = 720$. Write the 720 under the 728 and subtract, leaving a remainder of 8. Bring down the 0 of the dividend and place it to the right of the 8, making 80. 80 is contained in 80, 1 time. Place the 1 in the quotient directly above the 0. Then 80 is contained 91 times in 7280.

- | | | |
|-------------------|--------------------|--------------------|
| 2. $4860 \div 60$ | 7. $6150 \div 50$ | 12. $2760 \div 40$ |
| 3. $3690 \div 30$ | 8. $4720 \div 80$ | 13. $8370 \div 90$ |
| 4. $2790 \div 30$ | 9. $2600 \div 50$ | 14. $4880 \div 40$ |
| 5. $3150 \div 50$ | 10. $5670 \div 70$ | 15. $1440 \div 60$ |
| 6. $6480 \div 20$ | 11. $2880 \div 90$ | 16. $4110 \div 30$ |

17. A farmer raised 48,000 pounds of wheat. A bushel of wheat weighs 60 pounds. How many *bushels* of wheat did he raise? $48000 \div 60 = ?$

Do not introduce short method of canceling off zeros in divisor and dividend at this point, as it will tend to confuse the pupils in the long-division process.

DIVIDING BY MULTIPLES OF TEN¹ WITH A REMAINDER

1. Divide 864 by 20.

$$\begin{array}{r} 43\frac{4}{20} \\ 20 \overline{)864} \\ \underline{80} \\ 64 \\ \underline{60} \\ 4 \end{array}$$

This problem is divided in the same way as the problem on page 221. After the division has been performed, there is a remainder. This remainder is written as $\frac{4}{20}$, and is read four-twentieths.

864 contains 20 *forty-three and four-twentieths* times. Use long division in dividing the following:

- | | | |
|---------------|---------------|---------------|
| 2. 723 ÷ 40 | 15. 6245 ÷ 30 | 28. 8235 ÷ 60 |
| 3. 727 ÷ 60 | 16. 3713 ÷ 60 | 29. 3795 ÷ 90 |
| 4. 245 ÷ 30 | 17. 3223 ÷ 40 | 30. 5862 ÷ 20 |
| 5. 242 ÷ 80 | 18. 2567 ÷ 50 | 31. 1973 ÷ 40 |
| 6. 356 ÷ 70 | 19. 4325 ÷ 90 | 32. 8376 ÷ 90 |
| 7. 4863 ÷ 20 | 20. 6731 ÷ 40 | 33. 4563 ÷ 70 |
| 8. 6492 ÷ 80 | 21. 5723 ÷ 80 | 34. 6482 ÷ 30 |
| 9. 2504 ÷ 50 | 22. 7275 ÷ 60 | 35. 7586 ÷ 80 |
| 10. 3691 ÷ 60 | 23. 6762 ÷ 30 | 36. 8064 ÷ 20 |
| 11. 2483 ÷ 40 | 24. 6525 ÷ 50 | 37. 7143 ÷ 70 |
| 12. 7315 ÷ 90 | 25. 7332 ÷ 20 | 38. 6247 ÷ 60 |
| 13. 1975 ÷ 40 | 26. 8555 ÷ 70 | 39. 2875 ÷ 50 |
| 14. 2432 ÷ 20 | 27. 9778 ÷ 80 | 40. 9193 ÷ 90 |

41. A bushel of corn in the ear weighs 70 pounds. How many bushels are there in a wagon load of ear corn weighing 1835 pounds?

¹This step is very essential in teaching long division because the emphasis is placed here in getting the trial figure of the quotient with no difficulty arising from a large unit figure in the divisor.

FINDING THE QUOTIENT FIGURE

1. Divide 497 by 71.

$$\begin{array}{r} 7 \\ 71 \overline{) 497} \\ \underline{497} \end{array}$$

71 is near 70, so we divide 7, the tens' figure, into 49 to find the quotient figure 7. $7 \times 71 = 497$. The quotient figure 7 must be placed directly over the 7 of the dividend.

I. Divisors Ending in 1

- | | | |
|-------------------|-------------------|-------------------|
| 2. $168 \div 21$ | 12. $357 \div 51$ | 22. $246 \div 41$ |
| 3. $549 \div 61$ | 13. $568 \div 71$ | 23. $728 \div 91$ |
| 4. $287 \div 41$ | 14. $189 \div 21$ | 24. $105 \div 21$ |
| 5. $324 \div 81$ | 15. $486 \div 81$ | 25. $217 \div 31$ |
| 6. $637 \div 91$ | 16. $186 \div 31$ | 26. $639 \div 71$ |
| 7. $405 \div 81$ | 17. $364 \div 91$ | 27. $366 \div 61$ |
| 8. $426 \div 71$ | 18. $369 \div 41$ | 28. $567 \div 81$ |
| 9. $408 \div 51$ | 19. $488 \div 61$ | 29. $546 \div 91$ |
| 10. $279 \div 31$ | 20. $243 \div 81$ | 30. $306 \div 51$ |
| 11. $244 \div 61$ | 21. $255 \div 51$ | 31. $328 \div 41$ |

II. Divisors Ending in 2

- | | | |
|------------------|-------------------|-------------------|
| 1. $294 \div 42$ | 9. $434 \div 62$ | 17. $336 \div 42$ |
| 2. $738 \div 82$ | 10. $192 \div 32$ | 18. $360 \div 72$ |
| 3. $372 \div 62$ | 11. $198 \div 22$ | 19. $364 \div 52$ |
| 4. $256 \div 32$ | 12. $576 \div 72$ | 20. $132 \div 22$ |
| 5. $260 \div 52$ | 13. $644 \div 92$ | 21. $492 \div 82$ |
| 6. $368 \div 92$ | 14. $288 \div 32$ | 22. $248 \div 62$ |
| 7. $378 \div 42$ | 15. $558 \div 62$ | 23. $276 \div 92$ |
| 8. $656 \div 82$ | 16. $828 \div 92$ | 24. $504 \div 72$ |

Divisors ending in 2 cause more difficulty than those ending in 1 on account of the tens carried when the quotient figure is 5 or more. Use the tens' figure in estimating the quotient figure as shown in the first group above.

FINDING THE QUOTIENT FIGURE

III. Divisors Ending in 9 or 8

1. Divide 247 by 39.

$$\begin{array}{r} 6\overset{13}{39} \\ 39 \overline{) 247} \\ \underline{234} \\ 13 \end{array}$$

In this problem the tens' figure, 3, is contained in 24 eight times. 8×39 is 312, which is more than the dividend.

In using such divisors it is best to take the *nearest ten* for the trial divisor. 39 is nearer 40 or 4 tens. 4 is contained in 24, 6 times. Multiplying $6 \times 39 = 234$. Subtracting, we have a remainder (13) which is *less* than the divisor. Then 6 is the correct quotient figure.

- | | | |
|------------------|-------------------|-------------------|
| 2. $496 \div 59$ | 10. $281 \div 29$ | 18. $572 \div 78$ |
| 3. $495 \div 69$ | 11. $634 \div 69$ | 19. $378 \div 58$ |
| 4. $546 \div 89$ | 12. $713 \div 99$ | 20. $246 \div 28$ |
| 5. $371 \div 39$ | 13. $255 \div 49$ | 21. $634 \div 68$ |
| 6. $213 \div 99$ | 14. $248 \div 38$ | 22. $304 \div 98$ |
| 7. $248 \div 79$ | 15. $453 \div 88$ | 23. $361 \div 48$ |
| 8. $412 \div 49$ | 16. $567 \div 68$ | 24. $562 \div 58$ |
| 9. $428 \div 69$ | 17. $452 \div 48$ | 25. $324 \div 78$ |

IV. Divisors Ending in 3, 4, 5, 6, or 7

1. Divide 308 by 53.

$$\begin{array}{r} 5 \\ 53 \overline{) 308} \\ \underline{265} \\ 43 \end{array}$$

Dividing 30 by the nearest ten, 5, gives a quotient figure of 6. Multiply 53 by 6 mentally without setting down any figures. 6×3 makes 18—giving 1 ten to carry. 6×5 tens = 30 tens. 30 tens + 1 ten = 31 tens. 31 is larger than 30 so we must use a smaller figure (5) in the quotient. Doing this work mentally saves time and leaves the written work in neater shape.

- | | | |
|------------------|------------------|------------------|
| 2. $637 \div 73$ | 4. $281 \div 43$ | 6. $296 \div 74$ |
| 3. $415 \div 83$ | 5. $817 \div 93$ | 7. $470 \div 84$ |

- | | | |
|-------------------|-------------------|-------------------|
| 8. $417 \div 84$ | 13. $238 \div 86$ | 18. $423 \div 47$ |
| 9. $294 \div 44$ | 14. $214 \div 26$ | 19. $234 \div 27$ |
| 10. $135 \div 45$ | 15. $284 \div 46$ | 20. $603 \div 67$ |
| 11. $417 \div 55$ | 16. $602 \div 86$ | 21. $223 \div 47$ |
| 12. $675 \div 75$ | 17. $586 \div 76$ | 22. $284 \div 37$ |

PROBLEMS WITH A TWO-FIGURE DIVISOR

1. Divide 2945 by 31.

$$\begin{array}{r} 95 \\ 31 \overline{) 2945} \\ \underline{279} \\ 155 \\ \underline{155} \\ 0 \end{array}$$

31 is not contained in 29, so we must use 294.
 31 is contained in 294, 9 times. Be sure to place the 9 in the quotient *directly above* the 4 of the dividend. Subtracting 279, we have a remainder of 15. Bring down the next figure 5 of the dividend, making 155. 31 is contained 5 times in 155. Write the 5 in the quotient *directly above* the figure 5 of the dividend.

List I

- | | | |
|-------------------|--------------------|--------------------|
| 2. $2665 \div 41$ | 7. $7533 \div 81$ | 12. $9009 \div 91$ |
| 3. $3876 \div 51$ | 8. $2184 \div 91$ | 13. $5427 \div 81$ |
| 4. $4095 \div 91$ | 9. $5063 \div 61$ | 14. $1984 \div 31$ |
| 5. $3266 \div 71$ | 10. $4896 \div 51$ | 15. $5246 \div 61$ |
| 6. $3264 \div 51$ | 11. $6177 \div 71$ | 16. $8008 \div 91$ |

List II

- | | | |
|-------------------|--------------------|--------------------|
| 1. $3848 \div 52$ | 8. $3948 \div 42$ | 15. $3150 \div 42$ |
| 2. $2952 \div 82$ | 9. $3404 \div 92$ | 16. $4896 \div 72$ |
| 3. $2784 \div 32$ | 10. $4368 \div 52$ | 17. $2624 \div 32$ |
| 4. $4968 \div 92$ | 11. $2368 \div 32$ | 18. $3534 \div 62$ |
| 5. $3192 \div 42$ | 12. $4346 \div 82$ | 19. $6396 \div 82$ |
| 6. $6912 \div 72$ | 13. $4992 \div 52$ | 20. $2898 \div 42$ |
| 7. $4674 \div 82$ | 14. $5612 \div 92$ | 21. $3312 \div 92$ |

Use the method described under IV, page 224, to locate quotient figures.

PROBLEMS WITH A TWO-FIGURE DIVISOR

1. Divide 3136 by 49.

$$\begin{array}{r}
 64 \\
 49 \overline{) 3136} \\
 \underline{294} \\
 196 \\
 \underline{196} \\
 0
 \end{array}$$

49 is nearer 5 tens or 50 than 4 tens or 40. To estimate the first figure of the quotient, think 5 into 31. 5 is contained in 31, 6 times. In the same way think 5 into 19, remembering that 49 is slightly less than 50. 5 is contained in 19 nearly 4 times. Try 4 for the units' figure of the quotient. $4 \times 49 = 196$. This shows that some allowance must be made when the higher ten is taken.

List III

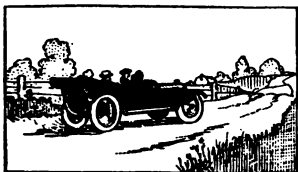
- | | | |
|--------------------|--------------------|--------------------|
| 2. $1225 \div 49$ | 12. $2478 \div 59$ | 22. $3115 \div 89$ |
| 3. $2686 \div 79$ | 13. $2088 \div 29$ | 23. $6873 \div 79$ |
| 4. $1209 \div 39$ | 14. $6237 \div 99$ | 24. $3822 \div 49$ |
| 5. $3068 \div 59$ | 15. $4266 \div 79$ | 25. $2346 \div 69$ |
| 6. $2175 \div 29$ | 16. $1387 \div 19$ | 26. $2494 \div 29$ |
| 7. $1615 \div 19$ | 17. $2695 \div 49$ | 27. $3422 \div 59$ |
| 8. $2346 \div 69$ | 18. $5658 \div 69$ | 28. $2847 \div 39$ |
| 9. $2808 \div 39$ | 19. $2886 \div 39$ | 29. $4059 \div 99$ |
| 10. $3038 \div 49$ | 20. $3953 \div 59$ | 30. $1615 \div 19$ |
| 11. $2759 \div 89$ | 21. $1334 \div 29$ | 31. $6478 \div 79$ |

List IV

- | | | |
|--------------------|--------------------|--------------------|
| 1. $2184 \div 28$ | 11. $3208 \div 38$ | 21. $5684 \div 58$ |
| 2. $5586 \div 98$ | 12. $4840 \div 88$ | 22. $3552 \div 48$ |
| 3. $3002 \div 38$ | 13. $3312 \div 48$ | 23. $1972 \div 68$ |
| 4. $3168 \div 88$ | 14. $6392 \div 68$ | 24. $4018 \div 98$ |
| 5. $4080 \div 48$ | 15. $1372 \div 28$ | 25. $1876 \div 28$ |
| 6. $2106 \div 78$ | 16. $4234 \div 58$ | 26. $2964 \div 78$ |
| 7. $3712 \div 58$ | 17. $2508 \div 38$ | 27. $2698 \div 38$ |
| 8. $4964 \div 68$ | 18. $3036 \div 98$ | 28. $1674 \div 18$ |
| 9. $2772 \div 28$ | 19. $4176 \div 48$ | 29. $5162 \div 58$ |
| 10. $1764 \div 98$ | 20. $4134 \div 78$ | 30. $3528 \div 98$ |

In List IV the nearest ten should be used in estimating the quotient figures. More allowance must be made, however, with numbers ending in 8 than those ending in 9.

REVIEW PROBLEMS IN LONG DIVISION



1. A party in a touring car drove 432 miles at an average speed of 18 miles per hour. How many hours did it take them to make the trip?
2. The distance from New York to New Orleans is about 1370 miles. How many hours would it take an automobile to travel this distance at a speed of 18 miles per hour?
3. A stock dealer asked the price of a drove of calves and found that the owner wanted \$28 apiece. He had \$700 to invest. How many of the calves could he buy for that amount?
4. A farmer raised 504 bushels of wheat on a field of 21 acres. Find his average yield per acre.
5. A grain dealer delivered a load of shelled corn weighing 2688 pounds. How many bushels of 56 pounds were there in the load?
6. What are 19 dozen eggs worth at \$.32 a dozen? How many yards of dress goods at \$.38 a yard can be purchased for that amount?
7. A gardener sold a merchant a load of potatoes weighing 2100 pounds. How many bushels of 60 pounds were there in the load?
8. It takes a certain passenger train 21 hours to go 609 miles. What is the average speed per hour of the train?
9. Harry gathered his onions and found that he had 2634 pounds. The weight of a bushel of onions in the state where he lived is 57 pounds. How many bushels did he raise? How many pounds did he have over that number of bushels?

REVIEW PROBLEMS

List V

- | | | |
|---------------|---------------|---------------|
| 1. 3458 ÷ 91 | 13. 4424 ÷ 79 | 25. 2046 ÷ 22 |
| 2. 4266 ÷ 79 | 14. 4554 ÷ 69 | 26. 3588 ÷ 69 |
| 3. 3213 ÷ 51 | 15. 3066 ÷ 42 | 27. 5185 ÷ 61 |
| 4. 2623 ÷ 61 | 16. 3588 ÷ 78 | 28. 4324 ÷ 72 |
| 5. 4292 ÷ 59 | 17. 4183 ÷ 89 | 29. 4189 ÷ 59 |
| 6. 2848 ÷ 89 | 18. 5893 ÷ 71 | 30. 4116 ÷ 49 |
| 7. 2146 ÷ 58 | 19. 5270 ÷ 62 | 31. 4368 ÷ 52 |
| 8. 2268 ÷ 81 | 20. 2038 ÷ 49 | 32. 3456 ÷ 48 |
| 9. 3198 ÷ 39 | 21. 3977 ÷ 41 | 33. 3627 ÷ 39 |
| 10. 1848 ÷ 28 | 22. 6150 ÷ 82 | 34. 3154 ÷ 38 |
| 11. 1794 ÷ 39 | 23. 2407 ÷ 29 | 35. 6674 ÷ 71 |
| 12. 2080 ÷ 32 | 24. 1769 ÷ 29 | 36. 2494 ÷ 58 |

List VI

- | | | |
|---------------|---------------|---------------|
| 1. 2805 ÷ 33 | 13. 3045 ÷ 87 | 25. 1624 ÷ 56 |
| 2. 2622 ÷ 57 | 14. 1548 ÷ 43 | 26. 4958 ÷ 74 |
| 3. 3192 ÷ 84 | 15. 2275 ÷ 25 | 27. 3196 ÷ 47 |
| 4. 3404 ÷ 46 | 16. 2844 ÷ 36 | 28. 2254 ÷ 23 |
| 5. 5733 ÷ 63 | 17. 3196 ÷ 34 | 29. 5785 ÷ 65 |
| 6. 3525 ÷ 75 | 18. 2115 ÷ 47 | 30. 1462 ÷ 17 |
| 7. 1836 ÷ 27 | 19. 1372 ÷ 14 | 31. 1896 ÷ 24 |
| 8. 3948 ÷ 94 | 20. 6205 ÷ 85 | 32. 3420 ÷ 95 |
| 9. 4730 ÷ 55 | 21. 4134 ÷ 53 | 33. 3486 ÷ 83 |
| 10. 3431 ÷ 73 | 22. 3182 ÷ 86 | 34. 3116 ÷ 67 |
| 11. 4158 ÷ 77 | 23. 7372 ÷ 97 | 35. 3555 ÷ 45 |
| 12. 6336 ÷ 64 | 24. 2860 ÷ 44 | 36. 5628 ÷ 84 |

List VI includes the most difficult divisors, those that are about midway between two multiples of ten. This type of problem requires a great deal of judgment in selecting the correct quotient figure. Use the method of multiplying mentally to check the quotient figure before setting it down in the quotient. Show how to check a division problem by multiplying the quotient by the divisor and adding in the remainder. Compare this result with the dividend.

PRACTICE PROBLEMS IN LONG DIVISION

1. Ruth's class went on a picnic. The children together planned a lunch which cost \$3.15. There were 21 children to pay this. What was each one's share?



2. Plan a lunch you would like if your class were going on a picnic. Find how much it costs each one of you.

3. Raymond joined a Savings Club in which, by making weekly payments, he received \$61.80 at the end of a year. This was an average saving of how much per month?

4. During one month in a certain room of 38 pupils there were in all 760 checks for misspelled words on four twenty-five word spelling tests. This was, on the average, how many words misspelled by each pupil? Is this better spelling than you do, or not so good?

5. In a school month of 19 days, a fourth grade class had 76 new and 114 review words in spelling. They had how many words each day? Do you have more or fewer words than these?

6. A sixth grade in the same time had 114 new words and 190 in review. How many words did they have each day?

7. The children in a certain city volunteered to raise \$1000 to be spent in buying lantern slides and other equipment for use in the schools. If this amount was equally divided among 25 schools, what was the number of dollars to be raised by each school?

LONG DIVISION—DRILL PROBLEMS

Divide each number in column I by its divisor shown in the first column. Work each of the other columns in the same way.

	Divisor	I	II	III	IV	V	VI	VII	VIII
A	41	2296	3403	1189	1927	2091	3649	3075	1886
B	74	7030	6142	1998	3404	6438	3626	2664	4366
C	28	1876	1624	2632	1204	2016	2548	1792	2324
D	32	2368	2624	2976	2400	2272	2688	3072	2848
E	56	2128	5264	4032	3528	4760	2612	3976	5376
F	89	6675	7387	4094	8188	6942	6141	4272	8633
G	97	6596	4753	5529	3004	7857	6693	4656	3589
H	63	5985	2394	4536	2898	4473	6174	4788	3087
I	45	3285	2160	3105	2340	3645	3420	4230	3555
J	72	3528	2736	5472	3744	4392	6912	6264	6840
K	51	4284	1989	3672	3111	2958	3519	2397	4998
L	38	3686	3192	2774	2356	3382	2888	3458	3116
M	94	2632	6862	4324	1786	5452	4418	6486	3666
N	53	3445	2597	2161	3286	4823	4346	2491	5194
O	86	3182	7310	4214	5332	7826	7224	6278	8170
P	29	2784	1653	2378	1247	2349	2204	2842	1363
Q	75	3600	6975	2025	4875	5325	6300	5925	4800
R	27	1593	1728	2241	1944	2403	2592	2187	1998
S	34	2584	3162	2890	2516	3162	2074	2958	3264
T	91	3458	4459	2457	4996	7917	6279	4641	3913
U	36	2304	2628	3312	3060	3384	2736	2988	3276
V	73	3285	4891	2774	2117	6132	2847	2993	4161
W	65	6045	3120	3315	4030	4810	5785	4485	5070
X	84	2856	5964	4704	7476	2268	4032	3276	8064
Y	48	4128	4416	3600	3888	1776	3216	2784	2352

THREE FIGURES IN THE QUOTIENT

List VII

This type of problem involves no new difficulty, merely requiring an additional step over a quotient of two figures.

- | | | |
|--------------------|---------------------|---------------------|
| 1. $30555 \div 63$ | 9. $84266 \div 91$ | 17. $15918 \div 42$ |
| 2. $20475 \div 75$ | 10. $22154 \div 38$ | 18. $50808 \div 87$ |
| 3. $36740 \div 44$ | 11. $32936 \div 46$ | 19. $42517 \div 61$ |
| 4. $60378 \div 87$ | 12. $23625 \div 25$ | 20. $16960 \div 95$ |
| 5. $17088 \div 96$ | 13. $11037 \div 39$ | 21. $40812 \div 76$ |
| 6. $42421 \div 59$ | 14. $75028 \div 68$ | 22. $20584 \div 83$ |
| 7. $45582 \div 71$ | 15. $36993 \div 57$ | 23. $21984 \div 24$ |
| 8. $76752 \div 82$ | 16. $11058 \div 19$ | 24. $69221 \div 89$ |

List VIII

THE ZERO IN THE QUOTIENT

1. Divide 18252 by 36.

$$\begin{array}{r}
 507 \\
 36 \overline{)18252} \\
 \underline{180} \\
 252 \\
 \underline{252} \\
 0
 \end{array}$$

After subtracting 180 from 182, we have a remainder of 2. Bring down the next figure, 5, making the remainder 25. Since 36 is not contained once in 25, we must place a 0 in the quotient directly above the 5 of the dividend. Bring down the next figure, 2, making the remainder

252. 36 is contained 7 times in 252. Place the 7 in the quotient above the 2 in units' place.

- | | | |
|---------------------|---------------------|---------------------|
| 2. $21868 \div 71$ | 12. $38532 \div 76$ | 22. $29260 \div 95$ |
| 3. $32630 \div 65$ | 13. $47377 \div 59$ | 23. $12960 \div 48$ |
| 4. $34352 \div 38$ | 14. $38164 \div 94$ | 24. $35100 \div 39$ |
| 5. $29743 \div 49$ | 15. $61336 \div 68$ | 25. $60150 \div 75$ |
| 6. $10692 \div 99$ | 16. $26265 \div 85$ | 26. $36401 \div 89$ |
| 7. $36648 \div 72$ | 17. $59274 \div 74$ | 27. $32947 \div 47$ |
| 8. $57024 \div 81$ | 18. $47058 \div 93$ | 28. $18666 \div 61$ |
| 9. $22311 \div 37$ | 19. $17020 \div 23$ | 29. $21060 \div 39$ |
| 10. $49032 \div 54$ | 20. $34068 \div 68$ | 30. $67956 \div 84$ |
| 11. $19656 \div 28$ | 21. $49680 \div 72$ | 31. $82560 \div 96$ |

REVIEW PROBLEMS IN LONG DIVISION

1. There are 16 ounces in a pound. 384 ounces are equal to how many pounds?
2. A 42-acre fruit farm is valued at \$9450. What is the value per acre?
3. 636 ounces are how many pounds?
4. A yard is equal to 36 inches. How many yards are equal to 900 inches?
5. In a certain city there are 840 school children enrolled. There are 24 teachers in the city schools. Each teacher has how many pupils on the average? Is this more or fewer pupils than your teacher has?
6. If an American flag is 78 inches wide, how many inches wide is each of the 13 stripes? How many feet wide is the flag?
7. If fence posts are set 16 feet apart, how many posts are needed to set a mile (5280 feet) of fence around a square field?
8. A farmer bought a tract of 38 acres of timber land near his farm for \$3610. What was the price which he paid per acre?
9. A truck gardener has cantaloupes which he is packing 14 in a crate. How many crates can he pack with 518 cantaloupes?
10. A merchant bought 41 tons of coal for which he paid \$307.50. What was the cost per ton?
11. A farmer sold 34 hogs for \$1288. What was the average price received per hog?
12. A bushel of barley weighs 48 pounds. How many bushels are there in a load of barley weighing 2208 pounds?
13. How many pounds are there in 244 ounces?

List IX

Divide the following and give the remainders¹, if any:

- | | | |
|--------------------|--------------------|---------------------|
| 1. $1740 \div 32$ | 19. $5016 \div 88$ | 37. $27328 \div 64$ |
| 2. $4118 \div 71$ | 20. $1588 \div 28$ | 38. $27412 \div 44$ |
| 3. $2019 \div 53$ | 21. $3432 \div 76$ | 39. $28050 \div 34$ |
| 4. $3024 \div 48$ | 22. $1579 \div 21$ | 40. $22464 \div 24$ |
| 5. $2376 \div 33$ | 23. $3234 \div 98$ | 41. $64218 \div 77$ |
| 6. $3174 \div 69$ | 24. $5041 \div 78$ | 42. $44745 \div 57$ |
| 7. $3900 \div 52$ | 25. $3648 \div 38$ | 43. $25164 \div 27$ |
| 8. $2968 \div 63$ | 26. $1495 \div 62$ | 44. $30315 \div 47$ |
| 9. $3526 \div 43$ | 27. $2964 \div 78$ | 45. $31598 \div 37$ |
| 10. $3007 \div 31$ | 28. $4897 \div 57$ | 46. $22828 \div 62$ |
| 11. $4266 \div 79$ | 29. $2747 \div 41$ | 47. $25108 \div 36$ |
| 12. $2706 \div 82$ | 30. $2852 \div 92$ | 48. $42872 \div 46$ |
| 13. $3526 \div 43$ | 31. $5478 \div 84$ | 49. $57325 \div 76$ |
| 14. $1602 \div 18$ | 32. $4896 \div 51$ | 50. $38872 \div 86$ |
| 15. $2738 \div 78$ | 33. $1595 \div 29$ | 51. $36925 \div 65$ |
| 16. $3283 \div 49$ | 34. $2156 \div 25$ | 52. $37935 \div 45$ |
| 17. $5002 \div 61$ | 35. $3096 \div 72$ | 53. $23870 \div 35$ |
| 18. $2912 \div 32$ | 36. $2326 \div 74$ | 54. $26107 \div 55$ |

55. A farmer sold 50127 pounds of oats. A bushel of oats weighs 32 pounds. How many bushels did he sell?

56. A farmer raised 1804 bushels of oats on 32 acres. What was his average yield per acre?

57. At a public sale 29 cows sold for a total of \$4843. What was the average selling price per cow?

¹ Reduction of remainders to lowest terms is not expected in the fourth grade.

DRILL PROBLEMS WITH A THREE-FIGURE DIVISOR

1. All the children in a certain new school, who could, brought pennies once a week with which to buy some good pictures for their building. During the first year \$104.80 was raised in this manner. With 524 children in the school, this was how much for each child?¹

Find the quotients:

- | | | |
|---------------------|-----------------------|-----------------------|
| 2. $32103 \div 261$ | 8. $201825 \div 621$ | 14. $250992 \div 581$ |
| 3. $99672 \div 426$ | 9. $125195 \div 365$ | 15. $125255 \div 235$ |
| 4. $68418 \div 543$ | 10. $108712 \div 428$ | 16. $111338 \div 179$ |
| 5. $93870 \div 298$ | 11. $143880 \div 872$ | 17. $282632 \div 824$ |
| 6. $72688 \div 472$ | 12. $325248 \div 924$ | 18. $350880 \div 645$ |
| 7. $74151 \div 231$ | 13. $110744 \div 436$ | 19. $221791 \div 863$ |

Divide the following:²

- | | | |
|---------------------|-----------------------|-----------------------|
| 1. $85425 \div 425$ | 8. $228734 \div 562$ | 15. $248056 \div 614$ |
| 2. $74292 \div 246$ | 9. $315884 \div 628$ | 16. $422838 \div 834$ |
| 3. $75190 \div 365$ | 10. $329536 \div 542$ | 17. $292128 \div 716$ |
| 4. $88182 \div 426$ | 11. $298979 \div 731$ | 18. $373902 \div 617$ |
| 5. $97020 \div 315$ | 12. $580215 \div 823$ | 19. $642330 \div 915$ |
| 6. $95580 \div 236$ | 13. $119392 \div 574$ | 20. $144179 \div 479$ |
| 7. $91778 \div 842$ | 14. $106128 \div 264$ | 21. $315381 \div 627$ |

¹The problems on this page require division with a three-figure divisor. As before, stress finding each figure of the quotient without a pencil in so far as it is practical. For example, in the first problem, show that *the 5 is the important part of the divisor*, because it constitutes the largest part, 500, that the tens must also be considered, while as a rule, the units are negligible in determining the trial quotient.

²These problems involve the troublesome 0 in the quotient. Since there is an inclination occasionally to skip a quotient figure where the first partial dividend is found insufficient and another figure must be brought down, this type of problem is one on which special drill should be given.

$$\begin{array}{r}
 407 \\
 562 \overline{) 228734} \\
 \underline{2248} \\
 3934 \\
 \underline{3934}
 \end{array}$$

LONG DIVISION¹

Exercise 1

$$79 \overline{)237} \qquad 54 \overline{)432} \qquad 78 \overline{)390} \qquad 96 \overline{)288} \qquad 83 \overline{)249}$$

$$74 \overline{)518} \qquad 29 \overline{)174} \qquad 68 \overline{)204} \qquad 92 \overline{)828} \qquad 49 \overline{)343}$$

$$58 \overline{)232} \qquad 79 \overline{)474} \qquad 88 \overline{)528} \qquad 63 \overline{)504} \qquad 91 \overline{)455}$$

Exercise 2

$$90 \overline{)4140} \qquad 30 \overline{)2370} \qquad 60 \overline{)5760} \qquad 4 \overline{)3880}$$

$$50 \overline{)3950} \qquad 80 \overline{)5920} \qquad 70 \overline{)4760} \qquad 20 \overline{)1780}$$

$$60 \overline{)5940} \qquad 40 \overline{)3920} \qquad 90 \overline{)5130} \qquad 70 \overline{)6720}$$

Exercise 3

$$41 \overline{)1435} \qquad 32 \overline{)1472} \qquad 21 \overline{)1953}$$

$$22 \overline{)1584} \qquad 51 \overline{)4233} \qquad 31 \overline{)2418}$$

Exercise 4

$$71 \overline{)1704} \qquad 52 \overline{)3224} \qquad 92 \overline{)2300}$$

$$61 \overline{)5124} \qquad 82 \overline{)3444} \qquad 91 \overline{)7553}$$

¹ Use the same time limits for these exercises as those given on page 178. Allow plenty of room for the work when these exercises are copied or mimeographed.

FOURTH YEAR

EXERCISE FOR PRACTICE, LONG DIVISION

Exercise 5

$72 \overline{)6552}$

$42 \overline{)3402}$

$81 \overline{)5913}$

$62 \overline{)4650}$

$71 \overline{)3763}$

$92 \overline{)2492}$

Exercise 6

$29 \overline{)1566}$

$48 \overline{)1392}$

$79 \overline{)6557}$

Exercise 7

$38 \overline{)2014}$

$99 \overline{)4653}$

$89 \overline{)5162}$

Exercise 8

$58 \overline{)5278}$

$69 \overline{)1104}$

$28 \overline{)2268}$

Exercise 9

$49 \overline{)3136}$

$88 \overline{)1672}$

$59 \overline{)4425}$

Exercise 10

$68 \overline{)1768}$

$39 \overline{)3549}$

$78 \overline{)4446}$

Exercise 11

$98 \overline{)5978}$

$83 \overline{)4897}$

$67 \overline{)5628}$

Exercise 12

$94 \overline{)7426}$

$75 \overline{)3675}$

$46 \overline{)3956}$

Exercise 13

$84 \overline{)5712}$

$63 \overline{)3591}$

$87 \overline{)6003}$

Exercise 14

$93 \overline{)69657}$

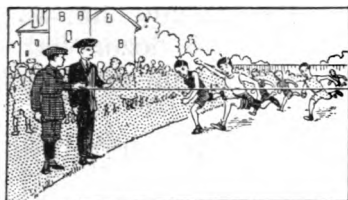
$76 \overline{)63536}$

Exercise 15

$85 \overline{)49895}$

$97 \overline{)81092}$

A GRADE TRACK MEET



The fourth grades of three city schools decided to have a track meet for both boys and girls. In a track meet, first counts 5 points, second 3 points, and third 1 point. Make a score card and enter under the name of each school

the number of points earned in each event as shown in the following:

SCORE CARD

Event	Lincoln's Points	Miles' Points	Central's Points
Boys' 50-yard dash	5	3	1

- Boys' 50-yd. dash: Lincoln 1st; Miles 2nd; Central 3rd.
- Girls' 50-yd. dash: Central 1st; Lincoln 2nd; Miles 3rd.
- Boys' 100-yd. dash: Lincoln 1st; Central 2nd; Miles 3rd.
- Girls' 100-yd. dash: Miles 1st; Central 2nd and 3rd.
- Boys' high jump: Lincoln 1st; Central 2nd; Miles 3rd.
- Girls' high jump: Miles 1st; Central 2nd; Lincoln 3rd.
- Boys' running broad jump: Miles 1st and 3rd; Lincoln 2nd.
- Girls' running broad jump: Central 1st; Lincoln 2nd; Miles 3rd.
- Boys' pole vault: Lincoln 1st; Central 2nd; Miles 3rd.
- Find the total number of points earned by each school. Which school won the meet?

RAISING POULTRY



1. With some money he had earned Paul bought 5 dozen baby chicks at \$.11 each. How much did they cost?

2. He also bought a hover for \$6.50, 2 gallons of kerosene for \$.19 a gallon, a pen for \$2.50, and 2 brooder drinking fountains at \$.25 each. What was the total cost of these supplies?

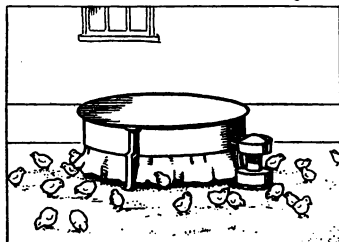
3. He purchased some cut alfalfa for \$.35, 2 packages of milk mash at \$.35 a package, and 50 pounds of chick feed at \$.05 a pound. What did his food for his chicks cost?

4. Find the total amount which he spent for chicks, hover, pen, fountains, oil, and food.

5. Paul lost a number of his chickens. 7 died the first week and 4 later. A rat or weasel carried off 3 and the cat caught 2. How many did he lose altogether?

6. How many did he succeed in raising out of the 60 which he bought?

7. Of those he succeeded in raising, 18 were roosters. How many hens did he have?



8. When the chickens were about 3 months old, Paul sold the 18 roosters at \$.85 apiece. How much did he receive for them?

9. He sold 14 of the hens to a poultry raiser for \$.95 each. What did he receive for the hens?

10. What was the total amount which he received for all of the chickens which he sold?

When his hens were old enough to lay, Paul sold eggs to his mother and the neighbors.

He marked on a calendar the number of eggs he found each day. During the month of February his hens laid as shown in the calendar at the top of the page.

SUN	Eggs bring good Prices	6	5	13	7	20	7	27	7
MON		7	7	14	6	21	5	28	5
TUE		1	3	8	6	15	5	22	6
WED		2	5	9	5	16	4	23	6
THU		3	4	10	6	17	7	24	5
FRI		4	7	11	4	18	4	25	8
SAT		5	6	12	5	19	6	26	6
TOTAL									

Keep
your Hens
Healthy
by
making
them
Work

11. Find the number of eggs which he collected each week. How many eggs did he receive the entire month? This is how many dozen?

12. What did he receive for them at an average price of \$.48 a dozen?

(Show that extra eggs over the number of dozen can be figured at 4 cents each.)

13. During March and April his hens laid 360 eggs. Of these he received 175 in March. How many did he receive during April?

14. He sold 14 dozen of these eggs at \$.45 a dozen; 12 dozen at \$.38 a dozen, and 4 dozen at \$.35 a dozen. Find the amount of his sales during March and April.

15. What did he receive for eggs during the three months? During that time he spent \$6.75 for feed. How much did he earn from the eggs during the three months?

THE "LITTLE PROTECTORS"

1. A young robin in captivity ate from 50 to 75 cut-worms and earth-worms a day for 15 days. Taking the average number per day as 60, how many did he eat in the 15 days?



2. A robin carrying a grub to its young every 5 minutes carries how many in an hour?

3. At this rate, how many will it carry in 10 hours?

4. Once, when there was a great pest of locusts, people tried to find if the birds were helping to destroy them. 6 robins which were examined had eaten 265. This was an average of how many per bird?

5. If 1 robin was eating 50 a day, how many did he eat in a week at that rate?

6. Two scarlet tanagers were watched while eating some very small caterpillars² of the gypsy moth. For 18 minutes they ate at the rate of 35 a minute. How many caterpillars did these two birds eat in the 18 minutes?

7. Suppose they were to eat at the rate of 35 a minute for an hour (60 minutes) a day. How many would they eat in a week?

¹Illustrations from *Farmers' Bulletin* 513, U. S. Dept. of Agriculture.

²In many kinds of insects the eggs laid hatch into tiny worms or caterpillars. It is the young which cause such damage to crops and trees, for they have very great appetites. The American silk worm eats so much during its life of 56 days that when full grown it weighs 4140 times as much as when it was hatched.



8. Another of our best friends is the bluebird. 3 bluebirds examined during the locust pest had eaten 67 of the grasshoppers. This was an average of how many for each bird?

The birds frequenting a 100-acre grain field in the south were closely studied one spring from March 29th to April 4th. From this study it was estimated that in the 6 days they ate the following number of insects:

Birds present	Insects eaten	Birds present	Insects eaten
300 goldfinches.....	318,000	2590 vesper sparrows..	396,225
20 field sparrows....	15,430	70 savannah sparrows	28,570
70 snow birds.....	3,920	245 chipping sparrows	168,560

9. Find the number of birds in the field.

10. According to the figures given, these birds together destroyed how many insects?

11. How many insects did they destroy per day?

12. In 4 hours and 37 minutes a pair of house wrens were seen to feed their young 1 white grub; 1 soldier bug; 3 millers; 9 spiders; 9 grasshoppers; 5 May-flies; 34 caterpillars, and 49 other insects of various kinds. How many insects did they carry to the baby wrens in that time?

13. A pair of rosebreasted grosbeaks with young birds in their nest made trips to feed them one day as follows:

Time	No. of trips	Time	No. of trips
6-7 A. M.	52	12-1 P. M.	32
7-8	47	1-2	38
8-9	43	2-3	41
9-10	30	3-4	22
11-12	63	4-5	38

14. They made how many trips in the 10 hours?

15. How many trips did they make per hour?

SOME THINGS THAT OTHER CHILDREN ARE DOING

1. A number of the children in a certain school take a little weekly newspaper. They read it in connection with their geography and history. One year they sent their subscriptions in one order as follows:

Grade 6B, 34 subscriptions; grade 6A, 42;
grade 7B, 40; grade 7A, 44.

Find the combined amount of their order at \$0.20 a subscription.

2. Some of the 8th-grade girls had a candy sale. In making their candy they used the following materials:

8 pounds of granulated sugar at 11 cents a pound; 2 pounds of nuts at 75 cents; 2 quarts of milk at 14 cents; 2 half-pound cakes of chocolate at 25 cents; 2 pounds of brown sugar at 10 cents; 4 pounds of dates at 25 cents; 1 pound of figs at 60 cents; 1 pound of butter at 65 cents, and flavoring 10 cents.

Find the cost of the above materials.

3. They cut each pan of fudge into 4 strips the long way with 9 strips across. Each pan held — pieces.

4. There were in all 360 pieces of fudge. How many pans had they made?

5. They put 3 pieces into each bag to sell for \$0.05. How many bags did the fudge fill?

6. They sold all these bags, and 42 bags of stuffed dates at \$0.05 a sack. What did they receive?

7. What did they realize from their candy making?

8. 4 girls had helped make the candy. What was each one's share of the profits? The girls used their money to pay for their cooking caps and aprons and other sewing supplies.

9. Some of the children in another school formed a little orchestra. With part of the proceeds from a concert, they bought sheet music as follows: 12 copies @ \$0.07; 8 copies @ \$0.06; 10 copies @ \$0.08; and 2 copies @ \$0.09. How much did they spend?

10. It required the sale of — tickets at 10 cents each to pay for this.

11. The fifth-grade pupils gave a "show" to which they charged 5 cents admission. So many children wanted to come that they had to repeat the performance 3 times. In all they took in \$4.50. How many tickets were sold?

12. They bought 2 lights for their microscope at \$0.40 apiece; 24 postcards showing scenes on the Great Lakes; 2 dozen on lumbering; 2 dozen on mining; 2 dozen scenes in Florida; and 6 dozen on other topics. All of these cards cost \$0.12 a dozen. How much money did they spend in all?

13. How much had they left?

14. The sixth-grade pupils made valentines in the drawing class and outside of school. Afterward they sold their best ones to the other children. What was received from the sale of 80 valentines at \$0.01 each; 30 at \$0.02; 25 at \$0.03; and 10 at \$0.05?

15. The pupils in one school formed a poultry club. Hazel had 3 dozen hens. The average egg yield for each hen was 160 eggs. How many eggs was that for the year?

16. How much did Hazel receive for the eggs at 45 cents per dozen?

17. Find Hazel's profit if her expenses were \$119.

FARM PROBLEMS

Market Prices

Wheat.....\$2.08	Pears.....\$2.00	Beets.....\$.10
Rye..... 1.25	Plums..... 2.00	Calves..... .12
Oats..... .67	Cherries..... .25	Lambs..... .18
Corn..... 1.20	Grapes..... .40	Chickens..... .23
Buckwheat... 1.75	Potatoes..... 1.60	Turkeys..... .35
Cloverseed...40.00	Sw. Potatoes.. 3.00	Ducks..... .24
Apples..... 7.50	Turnips..... 1.00	Geese..... .20
Peaches..... 3.00	Onions..... 1.25	Milk, 100 lb.. 3.50

Mr. Harry Handy, a bright young clerk in a business house in the city, invested his savings in a farm. The third year after moving to the farm he marketed the following products:

- | | | | |
|----------------|-----------|----------------|-------------|
| 1. Wheat | 550 bu. | 13. Milk | 47300 lbs. |
| 2. Rye | 60 " | 14. Potatoes | 273 bu. |
| 3. Oats | 725 " | 15. Sw. Pot's. | 14 " |
| 4. Corn | 575 " | 16. Turnips | 9 " |
| 5. Buckwheat | 15 " | 17. Onions | 11 sacks |
| 6. Clover seed | 5 " | 18. Beets | 152 bunches |
| 7. Apples | 145 bbls. | 19. Calves | 396 lbs. |
| 8. Peaches | 62 bu. | 20. Lambs | 232 " |
| 9. Pears | 18 " | 21. Chickens | 275 " |
| 10. Plums | 3 " | 22. Turkeys | 147 " |
| 11. Cherries | 16 bxs. | 23. Ducks | 85 " |
| 12. Grapes | 38 bask. | 24. Geese | 72 " |

1.-24. At the market quotations given in the table above, how much did Mr. Handy receive for each item?

25. What were his total receipts for the year?

Show the children how they may simplify this problem by finding, for example: the sum of the first six amounts, then that of the next six, etc., adding these four sums to find the total amount.

In fitting up his farm, Mr. Handy had many purchases to make. Some of the most important of these are named on the margin of this page:

Horses
Cows
Sheep
Pigs
Harness
Saddles
Wagons
Plows
Harrows
Hoes
Spades
Shovels
Pitchforks
Hammers
Hatchets
Axes
Saws
Augers
Nails
Tool chest
Scythes
Grindstone
Wheel barrow
Saw horse
Fence wire
Nuts
Bolts
Mower
Reaper
Hay rake
C. planter
Bu. baskets
 $\frac{1}{2}$ bu. meas.
Pk. measure
Qt. measure
Sacks
Lanterns

1. Mr. Handy's first purchase included 4 work horses, and for these he paid, respectively, \$135.00, \$110.00, \$87.50, and \$125.00. What was the total amount paid for horses?

2. He bought 9 selected cows, as follows: 4 Jerseys at \$150.00 each, 3 Holsteins at \$145.00 each, and 2 Alderneys at \$135.00 each. Find the cost of the cows.

3. He also bought 24 Cotswold sheep at \$20.00 each; and 10 Berkshire pigs, for which he paid \$67.60 in all. What did his sheep and pigs cost?

4. Mr. Handy bought 3 farm wagons and for these he paid as follows: 1 road wagon, \$124.50; 1 market wagon, \$97.50; and one wagon for delivering milk, \$110.00. What did his wagons cost?

5. Find the total cost of the following purchases: 1 steel-beam plow, \$17.75; 1 two-section harrow, \$7.95; 1 mower, \$45.70; 1 hayrake, \$32.50; 1 lawn mower, \$7.75.

6. Also the following items: 2 sets harness, \$58.75 each; 1 drop-force corn planter, \$50.00; 1 all-steel cultivator, \$9.75; 4 hoes, 65 cts. each; 2 shovels, \$1.35 each; 1 garden rake, 90 cts.

KITCHEN-GARDEN PROBLEMS

Price List ¹		
Spring chickens \$.30	Lettuce.....\$0.65	Watermelons..\$0.25
Eggs..... .36	Celery..... .65	Cantaloupes.. .07
Early potatoes .75	Early squash.. .15	Tomatoes.... .35
Radishes..... .02	Early peas.... .08	Cabbage..... 1.85
Early onions.. .08	Strawberries.. 2.75	Horse-radish.. .10
Cucumbers... .35	Blackberries.. 3.25	Spinach..... .65
String beans.. .75	Raspberries... 3.50	Rhubarb..... .10
Beets..... 1.50	Gooseberries.. 3.00	Asparagus.... .05
Carrots..... .55	Currants..... 3.00	Egg plant.... .08

Mrs. Handy and the children earned some money, too. Together they planted and took care of a vegetable garden. They also raised chickens and sold eggs. The second year they made the following sales:

1. S. Chickens 96 lbs.	14. Egg Plant 142
2. Eggs 276 doz.	15. Early Squash 29
3. E. Potatoes 38 pecks	16. Early Peas 43 lbs.
4. Radishes 412 bunches	17. Tomatoes 91 bask.
5. E. Onions 279 "	18. Cabbage 27 crts.
6. Cucumbers 56 bask.	19. Spinach 53 tubs
7. Str. Beans 37 crts.	20. Currants 3 crts.
8. Beets 18(100 bunches)	21. Strawberries 45 "
9. Carrots 25 "	22. Blackberries 35 "
10. Lettuce 48 cases	23. Raspberries 22 "
11. Celery 32 crts.	24. Gooseberries 6 "
12. Rhubarb 275 bunches	25. Horse-radish 35 roots
13. Asparagus 260 "	26. Watermelons 85

1.-26. What amount did they receive for each item?

¹Prices of farm and garden products are governed largely by the locality and the season. The prices scheduled in the above list are average prices for the year 1919. Should the prices change greatly from this list, it will make the work more practical to have the class make a new price list.

Many articles are needed in furnishing a home. Some of the things Mrs. Handy bought for her house are mentioned on the margin of this page.

Beds
Bedding
Stoves
Tables
Chairs
Dishes
Cutlery
Spoons
Pots
Kettles
Pans
Trays
Tubs
Wringer
Brooms
Dusters
Carpets
Rugs
Clocks
Pictures
Book-rack
Ink-stand
Sewing mach.
Lamps
Writing desk
Ice-box
Curtains
Ironing board
Clothes basket
Clothes brush
Bread box
Mirrors
Irons
Towels
Bird cage
Music box
Calendar

1. What was the cost of three bedsteads, 1 at \$33.50, 1 at \$27.25, and 1 at \$18.00?

2. Of 3 bedsprings at \$14.00 each?

3. Of $\frac{3}{4}$ dozen sheets at \$1.75 each? 6 yds. ticking at 65 cts. per yard, and ten pillow slips at 75 cts. each? $\frac{1}{2}$ dozen blankets at \$7.50 each, and $\frac{1}{4}$ dozen bedspreads at \$6.75 each?

4. Of 1 kitchen stove at \$65.00, 1 parlor stove at \$57.00, and 1 hall stove at \$37.50?

5. Of 1 dining room table at \$32.60, 1 parlor table at \$24.00, and 1 sewing table at \$7.75?

6. Of $\frac{1}{2}$ dozen dining room chairs at \$4.50 each, $\frac{1}{2}$ dozen parlor chairs at \$12.50 each, 4 bedroom chairs at \$3.00 each, and 2 kitchen chairs at \$2.00 each?

7. Of 1 pantry and kitchen outfit at \$22.50, 1 set of dishes at \$35.00, and other dining room articles at \$7.75?

8. Of 42 yards carpet at \$1.50 per yard, 2 rugs at \$12.50 each, 1 sewing machine at \$32.50, 1 clock at \$9.75, 1 mirror at \$4.75, 2 brooms at \$1.25 each?

ORANGE PROBLEMS

1. Do you like oranges? At 3 for a dime how many can you buy with half a dollar?

2. Most of our oranges are grown in California or Florida, where the land on which they are raised is worth from \$400 to \$600 per acre. What is the cost of a 15-acre tract at \$475 an acre?



3. When the trees are planted 20 feet apart, it requires about 108 trees to plant an acre. How many trees are needed to plant a 15-acre grove?

4. Find the cost of these trees at \$.95 each.

Orange groves, old enough to bear, are worth from \$1,000 to \$2,000 an acre. Three years after planting, a tree will produce one box of fruit; when 8 years old about 6 boxes; and when 15 years old 10 boxes. Orange trees 30 years old sometimes yield as much as 30 boxes a year.

5. In a certain year an orange grower found the expense of raising a box of oranges to be \$2.10 and the selling price was \$3.40. What was his profit per box?

6. What was his profit on a tree producing 10 boxes at that rate?

7. With 108 trees to an acre, find the profit per acre at that rate.

8. Find the profit on a grove of 15 acres.

9. Find the yield from a grove of 12 acres of old orange trees that yield 25 boxes per tree, counting 108 trees to the acre.

10. What will 300 boxes of oranges sell for at \$3.40 per box?

1. A fruit dealer told Robert that he had just bought 9 boxes of oranges at \$4.75 and asked him to figure up the bill for him. How much did they cost?



2. Martha bought 3 boxes of chocolates at \$.85 a box. How much did they cost?

3. During the month of March a dairyman received \$785.45 for milk. His expenses for the month were \$497.50. What was his profit for that month?

4. Four girls from a fourth grade picked strawberries one day during their vacation. One earned 68 cents, one 76 cents, one 84 cents, and one 72 cents. How much did they all earn that day?

5. Carl raised 49 bushels of early potatoes and sold them at \$1.75 per bushel. How much did he receive for them?

6. Gerald received a letter from his uncle in Iowa, telling him that he had sold his farm of 79 acres for \$17,775. How much did Gerald find he received per acre?

7. Ruth's mother gave her a dollar bill to pay for 2 dozen eggs at \$0.37 a dozen. How much change should she bring back?

8. James bought a ball for \$0.69. He gave the clerk a half dollar and a quarter. How much change should he have received from the clerk?

9. A class decided to have a picnic in a neighboring village. The teacher paid for the 27 tickets at \$0.36 each. How much did the tickets cost?

REVIEW PROBLEMS

10. A group of 9 children had a party for a friend who was moving away. They gave her a present which cost \$4.05. How much did each have to pay if they divided the expense equally?

11. In a small village school there are 9 boys and 8 girls in the third grade and 7 boys and 9 girls in the fourth grade. Find the total number of pupils in both grades.

12. On October 1st Edward entered 16 hens in an egg-laying contest for a year. Altogether his hens laid 2816 eggs. What was the average number of eggs per hen?

13. Martha, Alice, and Fred tended to the chickens one summer and made a profit of \$61.80. How much did each receive if they divided the profit equally?

14. Margaret worked at a canning factory in a neighboring city and earned \$11.95 during one week. How much did she have left if her total expenses amounted to \$7.89?

15. Five girls picked 240 quart boxes of strawberries in a day. How many 16-quart crates did they pick?

16. Mary bought 6 boxes of strawberries at \$0.23 a box and \$0.50 worth of sugar. How much did she spend for both?

17. Ethel had 79 stamps in her collection. Her uncle gave her 34 and her father 26 more. How many stamps did she then have in her collection?

18. Find the product of $95 \times \$32.50$.

In solving two-step problems, have the pupils tell what processes they are going to use in the solutions of the problems before allowing them to begin the computations.

1. Ellen bought 3 yards of ribbon at 15 cents a yard. She gave the clerk a half dollar to pay for the ribbon. How much change should she receive?

2. John bought 3 pounds of steak at 35 cents a pound and a piece of bologna for 25 cents. How much did he pay for both?

3. A farmer bought two cows for \$175 and \$148. He sold them for \$365. How much did he gain?

4. Margaret bought 3 pounds of prunes at 28 cents a pound, a pound of butter for 59 cents, and 45 cents worth of cheese. Find the total amount of her bill.

5. Alta bought 5 yards of dress goods at 85 cents a yard. How much change should she receive if she gave the merchant a \$5.00 bill to pay for it?

6. Mr. Bush owns a farm of 155 acres. He has 55 acres in corn, 35 acres in wheat, 26 acres in meadow, 3 acres in yard and stock lots, and the remainder in pasture. How many acres does he have in pasture?

7. Ella had \$17.95 in her savings account on January 1. During January and February she made deposits amounting to \$13.25 and checked out \$7.50. How much had she left?

8. Edwin bought a bicycle for \$17.50 and spent \$3.65 during the year that he owned it for repairs. He then sold it for \$15.25. How much did he pay for the use of it for the year?

TWO-STEP PROBLEMS

9. A store paid 42 cents a dozen for eggs and sold them for 45 cents a dozen. How much did it make on a case containing 30 dozen?

10. A fruit dealer bought a crate of 16 boxes of strawberries for \$3.20 per crate. How much did he make per box if he sold them for 28 cents a box?

11. Donald sold a grocer 3 dozen eggs at 42 cents a dozen and bought a pound of coffee for 55 cents. How much did the grocer then owe Donald?

12. Mr. Watson traded two city houses worth \$7450 and \$5750 for a farm of 60 acres. What was the value of the farm? What was the value of the farm per acre?

13. Arthur received \$10.00 for a birthday gift. He spent \$3.75 for a sled and \$1.65 for a cap. How much did he have left?

14. The expenses of a class picnic were \$6.08 for the lunch and \$5.76 for railroad fare. If they divided the expense equally among the 32 members of the class, how much did each have to pay?

15. George sold a grocer 85 pounds of shelled popcorn at 5 cents a pound and the grocer sold it at 8 cents a pound. How much did the grocer make on the 85 pounds?

16. Harry sold 3 dozen eggs at 40 cents a dozen and received in exchange rice at 15 cents a pound. How many pounds of rice did he receive?

17. Two girls sold 83 bags of popcorn at 5 cents a bag. Their expenses amounted to \$1.87. Find their profit.

MEASURING TIME

1. How many hours does it take for the hour hand to go around a watch face?

2. How many times does the hour hand go around the watch face in a day?

3. How many hours are there in a day?

4. How many minute spaces are there between any number and the next one? How many minute spaces are there around the whole circle of the watch face?

5. Since the minute hand goes completely around the watch face in an hour, how many minutes are there in an hour?

6. While the minute hand moves 60 minute spaces, the hour hand moves from one number to the next. The minute hand moves how many times as fast as the hour hand?

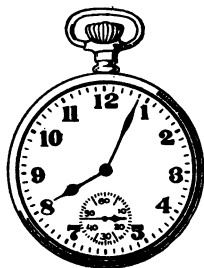
7. What number is usually left off a watch face on account of the dial for the second hand?

8. The dial for the second hand shows how many seconds there are in a minute. How many are there?

9. How many minutes are there in an hour? Find how many seconds there are in an hour.

10. How many hours are there in a day? Find how many seconds there are in a day.

11. How many minutes are there in a half hour? How many in a quarter of an hour? In a third of an hour?



WEEKS, MONTHS, AND YEARS

1. How many days are there in a week? Name them in order, beginning with Sunday.

2. Ethel spent her vacation of 12 weeks with her aunt in the country. How many days did she have in her visit?

3. How many days are there in 8 weeks? In 10 weeks? In 6 weeks? In 4 weeks?

The following table¹ shows how many days it usually takes between the time of planting and the time when the vegetable is ready to use:

Vegetable	No. of days	Vegetable	No. of days
Peas.....	63	Sweet corn.....	84
Radishes.....	28	Tomatoes.....	140
Lettuce.....	70	Potatoes.....	98
String beans.....	56	Carrots.....	91
Cabbage.....	98	Turnips.....	70
Cantaloupes.....	133	Watermelons.....	112
Squash.....	126	Celery.....	133
Cucumbers.....	70	Egg plant.....	126

4. How many weeks after planting will peas be ready to pick? If you plant peas on April 15, on what date will they be ready to use? (Use calendar on next page in finding the date of maturity).

5. Find the number of weeks it takes each of the other vegetables given in the table to mature so that they are ready for use on the table.

6. Which vegetable requires the shortest time to mature? Which requires the longest time?

¹The time given in this table is the average time. Under favorable weather the time will be shorter and under unfavorable conditions it will take longer. Have pupils make records for times of plantings and times of maturity for your locality and find the number of weeks required for each vegetable.

7. From the calendar on this page, find the number of days in each month.

Month	Sun.	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.
January	5	6	7	8	9	10	11
	12	13	14	15	16	17	18
	19	20	21	22	23	24	25
	26	27	28	29	30	31	
February	2	3	4	5	6	7	8
	9	10	11	12	13	14	15
	16	17	18	19	20	21	22
	23	24	25	26	27	28	
March	2	3	4	5	6	7	8
	9	10	11	12	13	14	15
	16	17	18	19	20	21	22
	23	24	25	26	27	28	29
April	6	7	1	2	3	4	5
	13	14	15	16	17	18	19
	20	21	22	23	24	25	26
	27	28	29	30			
May	4	5	6	7	8	9	10
	11	12	13	14	15	16	17
	18	19	20	21	22	23	24
	25	26	27	28	29	30	31
June	1	2	3	4	5	6	7
	8	9	10	11	12	13	14
	15	16	17	18	19	20	21
	22	23	24	25	26	27	28
July	6	7	1	2	3	4	5
	13	14	15	16	17	18	19
	20	21	22	23	24	25	26
	27	28	29	30	31		
August	3	4	5	6	7	8	9
	10	11	12	13	14	15	16
	17	18	19	20	21	22	23
	24	25	26	27	28	29	30
September	7	1	2	3	4	5	6
	14	15	16	17	18	19	20
	21	22	23	24	25	26	27
	28	29	30				
October	5	6	7	1	2	3	4
	12	13	14	15	16	17	18
	19	20	21	22	23	24	25
	26	27	28	29	30	31	
November	2	3	4	5	6	7	8
	9	10	11	12	13	14	15
	16	17	18	19	20	21	22
	23	24	25	26	27	28	29
December	7	1	2	3	4	5	6
	14	15	16	17	18	19	20
	21	22	23	24	25	26	27
	28	29	30	31			

8. Find the number of days in 1919 by adding the days in all 12 twelve months. 1919 is a *common year*.

Once every four years we have a longer year called a *leap year*. In a leap year February has 29 days instead of 28 days. All the other months contain the same number of days in a leap year as in a common year.

9. How many days are there in a *leap year*?

10. How many days are there in a week?

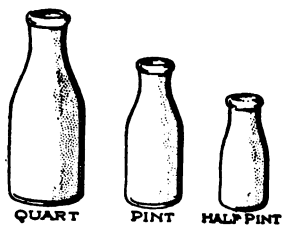
11. How many weeks are there in a year? (Consider only the whole number of weeks, discarding the fraction).

12. Fill in these blanks:

- seconds = a minute.
- minutes = an hour.
- hours = a day.
- days = a week.
- months = a year.
- days = a common year.
- days = a leap year.

Show that leap years are exactly divisible by 4.

LIQUID MEASURES



1. What sized bottles or measures are used in selling milk or cream?

2. How many half-pint bottles of cream does it take to make a pint bottle full?

3. How many quart measures of milk can be filled from a gallon pail? If you have forgotten, take a quart bottle and use it as a measure to fill a gallon pail.

4. How many pint bottles of milk can be filled with 2 gallons of milk?

Fill in the following blanks:

1 quart = — pints.	1 pint = — half pints.
1 gallon = — quarts.	1 gallon = — pints.

DRY MEASURES

1. What sized measures are used in measuring the following products: Onion sets, potatoes, wheat, apples, peaches, and cherries?

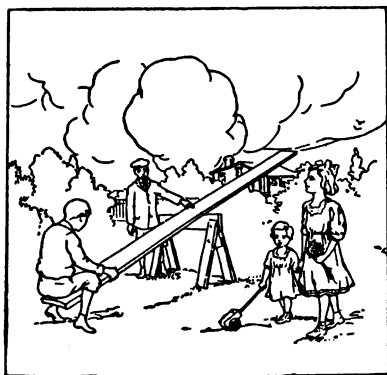
2. How many pecks of potatoes does it take to make a bushel?

3. If Elmer sold 20 pecks of new potatoes, how many bushels did he sell?

4. There are 8 quarts in a peck. How many quarts are there in a bushel of onion sets?

1 peck = — quarts.	1 bushel = — quarts.
1 bushel = — pecks.	1 quart = — pints.

Encourage pupils to bring in original problems coming within their experience involving the facts of liquid and dry measure.

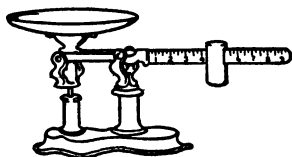


1. This is Roger sitting on the teeter. If the large girl and the other boy get on the other end, who will be up in the air? Why?

Two children "balance" each other on the teeter by one of them moving toward or away from the support while the other sits still.

2. Compare the weights of different packages by balancing them on a rude scales made of a stick suspended by a string tied halfway between the ends.

There are many kinds of scales for weighing. Look for them in the drug store, the grocery and meat-market, and at coal and lumber yards. All of these scales go back to the simple idea of balancing the weight of two things. Scales are sometimes called balances.

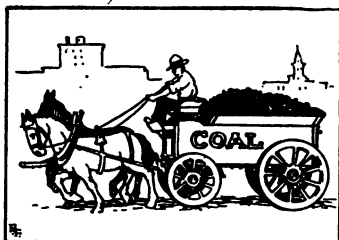


3. When your mother buys coffee at the grocery store, she does not say, "I want a package of coffee as heavy as that other package." She says, "I will take 1 *pound* of coffee." How does the grocer know how much coffee it takes to make a pound?

You may have noticed the weights with which the druggist weighs things. With shot or sand, which you can put a little at a time into either small bags or boxes, make some weights of your own. Make $\frac{1}{8}$, $\frac{1}{4}$, and $\frac{1}{2}$ lb. weights. How many ounces are there in a pound? Tell how many ounces there are in the following:

$\frac{1}{8}$ lb. = — oz. $\frac{1}{4}$ lb. = — oz. $\frac{1}{2}$ lb. = — oz.

THE TON



Hay, iron ore, coal and some other articles are measured by the ton.

A Ton = 2000 pounds.

1. You have probably seen freight cars filled with coal. A car holding 40 tons, carries how many pounds of coal?
2. In the city, coal is usually delivered in 100 pound sacks. A ton fills how many such sacks?
3. It takes 14 tons of coal to heat a certain house during the winter. What does this cost at \$12.25 a ton?
4. A certain business house uses 120 tons of bituminous (soft) coal in a winter. Find the cost at \$6.25 a ton.
5. In the ore pits of the Lake Superior region, there are steam shovels which lift out 5 tons of ore at a scoop. How many pounds does such a shovel take at one time?
6. A certain 20 room school house requires about 1500 lbs. of coal a day to heat it during cold weather. This is how many pounds a week, including Sunday?
7. This is equal, in "round numbers" to how many tons? What is its cost at \$8 per ton?
8. Two horses are pulling a wagon which weighs 3000 pounds. The wagon has in it 3800 pounds of coal. Including the weight of the driver, 200 pounds, the horses are pulling — pounds? This is how many tons?

9. In a certain year, the number of tons of coal mined, in the leading coal states was as follows:

Pennsylvania,	200,575,617	Ohio,	27,731,640
Illinois,	41,480,104	Alabama,	13,107,963
West Virginia,	42,290,350	Indiana,	12,092,560

Find the total number of tons mined by these six states together.

10. The value of the anthracite (hard) coal mined in Pennsylvania during a certain year was \$148,957,894. The value of the anthracite coal reported from other states was \$222,577. Find the value of the total output for that year.

11. This same year all the bituminous (soft) coal mined in this country was valued at \$401,333,395. It was worth how much more than the anthracite?

12. A certain locomotive engine in a day's run burns 15,000 pounds of coal. This is how many tons?

13. Harvey's father sold 80 bales of hay, average weight 75 lbs. What was the total weight in tons?

14. An Oregon fish cannery put up, in one season, 500 tons of salmon. How many 1 lb. cans would this fill?

15. If certain sheep average 6 lbs. of wool a year, it will require how many such sheep to grow 12 tons of wool?

16. A bale of cotton weighs 500 pounds. How many such bales together weigh a ton?



17. How many together weigh 6 tons?

18. How many pounds in a ton?

MEASURING DISTANCES



LAYING OUT A BALL DIAMOND

These boys are laying out a baseball diamond. Do you know how long the side of a baseball diamond is? A regular diamond is 90 feet long on each side. The boys measured out a full-sized diamond and decided that it was too large for boys of their size, so they decided to make their diamond 75 feet on each side.

1. How many yards long is one side of a regular ball diamond? How many yards do you have to run to make a home run on a regular ball diamond?

2. How many yards long was a side of the small diamond that the boys laid out? How many yards did they have to run in making a home run?

3. The front edge of the home plate of a diamond is 1 foot and 5 inches wide. That is how many inches?

4. Measure the length of your schoolroom. Express the length in both yards and feet.

5. Measure other objects in your schoolroom, such as the top of the table, a desk, the blackboard, and the width of the doors and windows.

6. Two boys measured the basket ball court in their gymnasium. They found it to be 66 feet long and 39 feet wide. Express these distances in yards.

You may have heard some one say that a certain field is 40 *rods* long or 80 *rods* long.

Like the foot and yard, the *rod* is used for measuring distances. But it is used for measuring longer distances than they are, because a rod = $16\frac{1}{2}$ feet.

1. On your schoolroom floor, or the playground, draw a line 1 rod long, marking it off into $16\frac{1}{2}$ feet.

Have the pupils measure distances on the school ground with a string a rod long.

2. How tall are you? A rod is about how many times as long as you are tall?

3. How many rods would one walk following the fence around a pasture 40 rods on each of the 4 sides?

4. As there are 320 rods in a mile, what part of a mile would this be?

5. In some cities 8 city blocks are considered a mile. A mile is 5280 feet long. When counting 8 blocks to a mile, what is the length of each block?

6. In most cities the blocks are shorter than in problem 5. When each block is only 440 feet long, how many are considered a mile?

7. Lengths of railways, rivers, and a number of other distances are stated in miles. Try to think of at least two other distances that are measured by the mile.

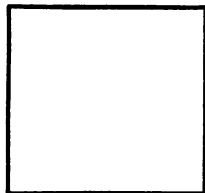
8. In running around a school athletic track a boy runs $\frac{1}{4}$ mile. How many feet long is this track? (See problem 5 for the number of feet in a mile.)

9. Men have gone up in balloons to heights of about 6 miles. How many feet high did they go?

SQUARE MEASURE

1. How long is each side of this square? Use your ruler to find out how long it is.

2. This square is called a square inch. Why?



3. Out of cardboard, or fairly stiff paper, cut 24 inch-squares. How many of these inch-squares do you use in making a rectangle like the one shown at the right side of this page?

Use your inch squares to make rectangles or draw them with the following dimensions. How many inch-squares in each rectangle?

- | | |
|--------------------------|---------------------------|
| 4. 4 inches by 2 inches. | 7. 7 inches by 3 inches. |
| 5. 8 inches by 3 inches. | 8. 9 inches by 2 inches. |
| 6. 6 inches by 4 inches. | 9. 12 inches by 2 inches. |

10. One can always find how many square inches there are in a rectangle by building it with inch-squares. But there is an easier way¹ to tell. What is it?

11. How many different rectangles can you make, using 36 inch-squares each time? Write the length and width of each rectangle you can make. Do not use the cardboard squares if you are sure you are right in *thinking* how they would be arranged.

¹Show that the number of inch-squares can be found by multiplying the number of inch-squares in *one* row by the number of rows in the rectangle.

An interesting exercise in this connection is to cut out plain cardboard rectangles and have the pupils *estimate* the length, width, and number of square inches in the whole cardboard. Keep the dimensions in whole inches. Compare their answers with the correct area.

Without building with the inch-squares, tell how many square inches there are in each of the following rectangles:

The sign " stands for inches.

- | | | |
|--------------|-------------|----------------|
| 1. 9" by 4" | 5. 7" by 5" | 9. 7" by 12" |
| 2. 8" by 6" | 6. 8" by 7" | 10. 12" by 8" |
| 3. 12" by 6" | 7. 4" by 8" | 11. 12" by 11" |
| 4. 8" by 9" | 8. 9" by 5" | 12. 9" by 7" |

13. Find to the nearest foot the length and width of your schoolroom. Is it larger or smaller than a room 30 feet by 24 feet¹?

14. On the blackboard draw a rectangle the same shape as your schoolroom floor. Draw the sides just as many *inches* long as the sides of your floor are *feet* long. You can now mark off your play floor into rows 1 inch wide. Divide the rows into inch-squares.

15. How many inch-squares are there in 1 row of your play floor? How many such rows are there? Multiply the number of inch-squares in 1 row by the number of rows to find how many inch-squares there are in the play floor.

16. Since each inch-square stands for a square foot on the real floor, how many square feet are there in 1 row along the side of the real floor? How many rows a foot wide are there in the real floor? Then how many square feet are there in the schoolroom floor?

Have pupils measure rooms at their homes and make problems for the class to solve.

¹The answering of this question brings out two facts: (1) in order to tell the exact difference in size, the areas of the two rooms must be found; (2) a larger unit than the square inch, namely the *square foot*, is used to express the area.

SQUARE MEASURE

17. How many square feet are there in the floor of a room 32 feet by 24 feet?

18. By how many square feet is your room larger or smaller than the room 32 feet by 24 feet?

The sign ' is used to represent feet.

Tell the number of square feet in the following rectangles:

- | | | |
|----------------|----------------|----------------|
| 19. 9' by 5' | 23. 11' by 12' | 27. 9' by 6' |
| 20. 12' by 16' | 24. 7' by 9' | 28. 14' by 12' |
| 21. 8' by 9' | 25. 10' by 12' | 29. 15' by 20' |
| 22. 10' by 18' | 26. 10' by 15' | 30. 9' by 12' |

Many people do not have enough sunlight in their houses. If you were to take the windows from a properly lighted room and lay them on the floor, they would cover at least $\frac{1}{2}$ of the area of the floor space.

31. A room whose floor area is 120 square feet should have how many square feet of windows to be properly lighted?

32. A room with a floor area of 140 square feet needs how many square feet of windows?

33. The area of a schoolroom 30' by 24' is how many square feet? To be properly lighted it needs how many square feet of windows?

34. You have already found the area of your own schoolroom (Problem 16). How many square feet of window space should it have to be properly lighted?

35. With your teacher's help, find out as nearly as you can the amount of window space in your room. How does it compare with the required number of square feet?

Do not attempt more than approximate measurements in whole feet.

Why should people screen their houses?

Ordinarily screen netting is sold by the square foot. Carpenters buy it in 100 foot rolls at 3 cents a square foot.

1. How many square feet of netting are needed for a door 7 feet by 3 feet? Do not allow any for waste.

2. A window has an upper and a lower pane, each 3 feet by 3 feet. How many square feet are needed for each pane?

3. How many square feet of netting are needed for 1 window?

Poultry netting is also sold by the square foot. This may be bought in widths from $1\frac{1}{2}$ to 8 feet.

4. John needs a strip of netting 2 feet wide and 24 feet long to put around his rabbit pen. How many square feet does he need?

5. Phillip had the pen for his older chickens fenced in with netting 8 feet high. It took a strip 72 feet long to go around. How many square feet of netting were there in his fence?

6. The pen for the smaller chickens was inclosed with a strip of netting 3 feet wide and 36 feet long. How many sq. feet of netting were needed?

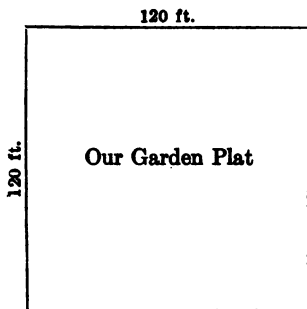
7. A sweet pea trellis 3 feet wide and 24 feet long contains — sq. feet of netting?

8. A morning glory trellis 8 feet high and 12 feet long contains — sq. feet of netting?

9. What does it cost at \$0.03 a square foot?

10. Does it cost more or less than the sweet-pea trellis, and how much?

PUPILS' OWN PROBLEMS



Original problems prepared by a fifth grade class, in a certain city school, for fourth grade pupils to solve.

I. Can you work all of these problems?

II. Can you make other problems like them?

1. How many sq. yds. are there in the area of our garden?

2. How many garden beds can be made if each shall be 20 ft. by 10 ft.? Draw a plan.¹

3. How much will it cost to build an iron fence around our garden, not allowing for gates, at 75 cts. a ft.?

4. How much would it cost to put 12 posts on each side at 25 cts a post? (Show that only 45 are needed.)

5. How far apart would they be? (Draw to a scale.)

6. If each post is 10 ft. long and extends into the ground 3 ft. how far would each post stick up in the air?

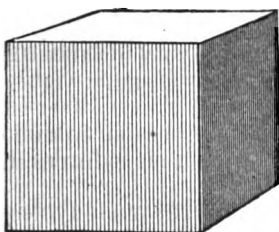
7. How many posts will be needed in our garden fence if they shall be placed 5 ft. apart?

8. I planted 16 rows of radishes and each row contained 50 doz. I sold them at 10 cts a doz. How much did I make?

9. What would it cost to fertilize the garden at $\frac{1}{2}$ ct. a sq. ft.?

¹All pupils' drawings of this kind should be made to a definite scale.

CUBIC MEASURE



From your oral work in Science or Physiology, you may have learned about the reasons for having fresh air in our homes, schools, churches, and other places where people are indoors.

Perhaps you have read, or been told, that each child in your school-room should have 2000 *cubic feet* of pure air to breathe every hour.

1. How many children are there in your room? How many cu. ft. of air do you together need in an hour?

The average schoolroom does not hold nearly so much air as this. You can find out if yours does, in this way:

2. Find to the nearest foot the length, width, and height of your school room.

3. Letting an inch represent a foot, make a cardboard box to represent your room. How many inches long must it be? How many inches wide? How many inches high?

Your teacher will show you what a *cubic inch* is. A *cubic foot* is as large as a cube or square block, a foot long, a foot wide, and a foot high. In making your cardboard room, you may let a cubic inch represent a cubic foot.

4. By packing inch cubes, like blocks, into your paper room, find how many cubic feet your "schoolroom" contains.

5. How many cubic feet or less than the number needed in an hour does it hold?

6. How many hours are you in the room? How many cubic feet of air are needed for you in a day?

7. What is done in your schoolroom to provide this additional fresh air for you to breathe?

8. The cubic foot is used to measure other things besides air. Try to find out some of them.

If there is a fan in your building, you may be able to make some more problems about the amount of fresh air it forces in.

9. In Henry's room at school there was a new sand table, 8 feet long, 3 feet wide, and 1 foot deep. The boys helped the janitor fill it half full with clean, white sand. How many cubic feet of sand did it take?

No formal rule for finding the cubic contents should be given in this grade. Use the block idea to make the problems clear.

PROBLEMS IN VISUALIZATION

1. How many faces has a cube?

2. Build a figure with two cubes.

How many faces has it?



3. How many of the faces of this figure are squares?

4. How many are oblongs?

5. Think of a room 24 feet long, 16 feet wide, and 11 feet high. What are the dimensions of the floor?

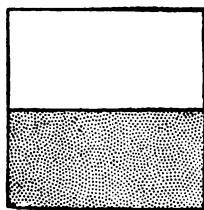
6. What are the dimensions of the sides?

7. What are the measurements for the ends?

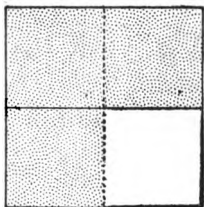
8. How long and how wide is the ceiling?

9. A building lot 80' by 150' has a garden across the back as wide as the lot and 20' from back to front. How long and how wide is the part of the lot remaining?

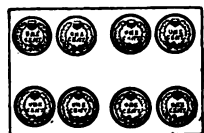
Fold a sheet of paper along a line across the middle as shown in the illustration and crease along the middle line. If you tear the paper along the crease, you have it divided into *two* equal parts. Each of these parts is called one-half (or $\frac{1}{2}$). What part of the sheet does the shaded portion represent?



Fold a square sheet of paper along the solid line shown in the middle and then unfold it and fold it along the dotted line across the middle. Into how many equal parts have you divided the piece of paper? Each of the *four* equal parts of the piece of paper is called a *fourth*. How many fourths of the paper are shaded in the illustration?



If you put 8 pennies into 4 equal groups, each of the four groups is called a *fourth*. One-fourth of 8 pennies = ? pennies? How many pennies are there in three-fourths of the 8 pennies?



Three-fourths may also be written in the short form $\frac{3}{4}$. The number 4, below the line, shows into how many equal groups or parts the number must be divided. The number 3, above the line, shows how many of these groups or parts form the fraction.

A fraction represents one or more of the equal parts of a whole thing (or a group of things).

1. What is one-half of 12 bananas?
2. Fold a sheet of paper into 8 equal parts. What is each part called?
3. What is one-eighth of 72 cents? If I have 72 cents and spend five-eighths of them for a dozen oranges, how much do the oranges cost per dozen?

FINDING FRACTIONAL PARTS OF NUMBERS

1. Take a strip of paper 12 inches or one foot long.
2. If you wish to cut the strip into fourths, how many equal parts do you plan? Show these parts by folding. Without cutting you can see each part is $\frac{1}{4}$ of 12 inches or — inches. Measure each part with your ruler to see if this is not true.
3. Cut the strip into fourths. Again show $\frac{1}{4}$ of the strip. It is — inches long. Can you tell without using the ruler how much $\frac{3}{4}$ of 12 inches are?

Measure to see if you are right.

$$\frac{1}{4} \text{ of } 12 = \qquad \qquad \frac{3}{4} \text{ of } 12 =$$

4. Think of a strip 1 yard or 36 inches long. $\frac{1}{4}$ of 36 inches = — inches. $\frac{3}{4}$ of 36 inches = — inches.

Let some one in the class prove your answer by cutting a yard strip into fourths and measuring $\frac{3}{4}$ of it.

5. Think of a strip 24 inches long. $\frac{1}{4}$ of 24 inches = — inches. $\frac{3}{4}$ of 24 inches = — inches.

6. Think of a dozen eggs. $\frac{1}{4}$ of 12 eggs = — eggs. $\frac{3}{4}$ of 12 eggs = — eggs.

7. Prove by letting one pupil show this to the rest using stones or anything else at hand for eggs.

8. Think of 16 blocks. $\frac{1}{4}$ of 16 blocks = — blocks. $\frac{3}{4}$ of 16 blocks is —.

$\frac{1}{4}$ of 8 =	$\frac{1}{4}$ of 24 =	$\frac{1}{4}$ of 16 =	$\frac{1}{4}$ of 32 =
$\frac{3}{4}$ of 8 =	$\frac{3}{4}$ of 24 =	$\frac{3}{4}$ of 16 =	$\frac{3}{4}$ of 32 =
$\frac{1}{4}$ of 28 =	$\frac{1}{4}$ of 4 =	$\frac{1}{4}$ of 36 =	$\frac{1}{4}$ of 20 =
$\frac{3}{4}$ of 28 =	$\frac{3}{4}$ of 4 =	$\frac{3}{4}$ of 36 =	$\frac{3}{4}$ of 20 =

FINDING FRACTIONAL PARTS OF NUMBERS

If you wish to divide a foot of ribbon into thirds, you plan — equal parts. Using a strip of paper for ribbon, show $\frac{1}{3}$ of a foot. Show $\frac{2}{3}$ of it. Can you tell without measuring how much $\frac{2}{3}$ of 12 inches are? Prove you are right.

$$\begin{array}{lll} \frac{1}{3} \text{ of } 9 = ? & \frac{1}{3} \text{ of } 30 = ? & \frac{1}{3} \text{ of } 24 = ? \\ \frac{2}{3} \text{ of } 9 = ? & \frac{2}{3} \text{ of } 30 = ? & \frac{2}{3} \text{ of } 24 = ? \end{array}$$

$$\begin{array}{lll} \frac{1}{3} \text{ of } 18 = ? & \frac{1}{3} \text{ of } 6 = ? & \frac{1}{3} \text{ of } 15 = ? \\ \frac{2}{3} \text{ of } 18 = ? & \frac{2}{3} \text{ of } 6 = ? & \frac{2}{3} \text{ of } 15 = ? \end{array}$$

$$\begin{array}{ll} \frac{1}{3} \text{ of } 12 = ? & \frac{1}{3} \text{ of } 27 = ? \\ \frac{2}{3} \text{ of } 12 = ? & \frac{2}{3} \text{ of } 27 = ? \end{array}$$

Draw an oblong and show $\frac{1}{6}$ of it. Show $\frac{3}{6}$ of it. Show $\frac{5}{6}$ of the oblong.

If you wish to divide a pie into sixths, you plan — equal parts. Using a circle for the pie show $\frac{1}{6}$ of a pie. Show $\frac{4}{6}$. Show $\frac{5}{6}$.

$$\begin{array}{lll} 1. & 2. & 3. \\ \frac{1}{6} \text{ of } 12 = ? & \frac{1}{6} \text{ of } 24 = ? & \frac{1}{6} \text{ of } 30 = ? \\ \frac{5}{6} \text{ of } 12 = ? & \frac{5}{6} \text{ of } 24 = ? & \frac{5}{6} \text{ of } 30 = ? \end{array}$$

$$\begin{array}{lll} 4. & 5. & 6. \\ \frac{5}{6} \text{ of } 18 = ? & \frac{5}{6} \text{ of } 6 = ? & \frac{5}{6} \text{ of } 36 = ? \end{array}$$

$$\begin{array}{lll} 7. & 8. & 9. \\ \frac{5}{6} \text{ of } 54 = ? & \frac{5}{6} \text{ of } 42 = ? & \frac{5}{6} \text{ of } 48 = ? \end{array}$$

- | | |
|-------------------------|---------------------------------|
| 10. A yard = — inches. | $\frac{5}{6}$ yard = — inches. |
| 11. A foot = — inches. | $\frac{5}{6}$ foot = — inches. |
| 12. — things = a dozen. | $\frac{5}{6}$ dozen = — things. |

ORAL WORK

1. $\frac{1}{2}$ foot = ? inches. $\frac{1}{3}$ foot = ? inches. $\frac{5}{6}$ foot = ?
2. $\frac{3}{4}$ yard = ? inches. $\frac{1}{6}$ yard = ? inches. $\frac{5}{6}$ yard = ?
3. 1 pound = ? ounces. $\frac{1}{2}$ pound = ? ounces.
 $\frac{1}{4}$ pound = ? ounces.
4. $\frac{1}{8}$ pound = ? ounces. $\frac{3}{8}$ pound = ? ounces.
 $\frac{5}{8}$ pound = ? ounces.
5. 1 peck = ? quarts. $\frac{1}{2}$ peck = ? quarts. $\frac{3}{4}$ peck
= ? quarts.
6. 1 gallon = ? quarts. $\frac{3}{4}$ gallon = ? quarts.
7. 1 bushel = ? quarts. $\frac{3}{4}$ bushel = ? quarts.
8. $\frac{1}{8}$ bushel = ? quarts. $\frac{3}{8}$ bushel = ? $\frac{7}{8}$ bushel = ?

WRITTEN WORK

Some schools furnish the children's books. There are many volumes to be kept clean and in good condition. Of course some are worn out every year.

1. In checking up a set of 96 readers, a teacher found that $\frac{5}{6}$ of them were in good condition. How many was that?

2. A set of 84 geographies, which had been used nearly every day by 6 classes, was very much the worse for wear. She found that $\frac{2}{7}$ of them needed rebinding. How many geographies had to have new covers?

3. There were 420 copy-books. $\frac{3}{4}$ of them were out of date. How many old books were there?

4. In all there were 168 first books in arithmetic. $\frac{7}{8}$ of these did not need any repairs. How many arithmetics were in good condition?

PRACTICAL PROBLEMS

1. What is the cost of 3 pounds of candy at \$0.30 a pound?
2. What does $\frac{1}{2}$ pound cost at this price?
3. How can you find what $3\frac{1}{2}$ pounds cost?
4. What is the cost of 2 dozen bananas at \$0.20 a dozen?
5. What do $\frac{3}{4}$ of a dozen cost?
6. How do you find the cost of $2\frac{3}{4}$ dozen?
7. Find the cost of $4\frac{1}{2}$ pounds of meat at \$0.26 a pound. How will you do this problem?

The work may be put down so:

$$\begin{array}{r} \$0.26 \\ \quad 4\frac{1}{2} \\ \hline \$1.04 \\ \quad .13 \\ \hline ? \end{array}$$

or

$$\begin{array}{r} \$0.26 \\ \quad 4\frac{1}{2} \\ \hline \$0.13 \\ \quad 1.04 \\ \hline ? \end{array}$$

What difference is there in the two ways?

8. Find the cost of $8\frac{1}{2}$ yards of ribbon at \$0.42 a yard?
9. What is the cost of $2\frac{3}{4}$ tons of hard coal at \$8.20 a ton?

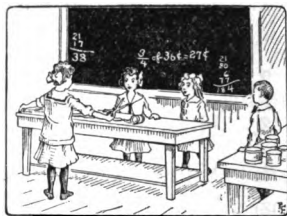
$$\begin{array}{r} \$8.20 \\ \quad 2\frac{3}{4} \\ \hline ? ?? \\ \quad ? ?? \\ \hline ?? \end{array}$$

$$\begin{array}{r} 4)\$8.20 \\ \quad ? ?? \\ \times 3 \\ \hline ? ?? \end{array}$$

10. Find the cost of $4\frac{3}{5}$ tons of soft coal at \$4.25 a ton.

USING THE FRACTIONAL PART

Ask at the dry goods store for discarded ribbon bolts and use these long strips of paper for "ribbon" to stock a play store. The "clerks" may measure and cut the "ribbon" and make change for the "customers" with toy money. You may have the following sales among others:



Playing Ribbon Counter

1. $\frac{1}{2}$ yd. at \$0.16. Change a quarter.
2. $\frac{5}{8}$ yd. at \$0.24. Change 2 dimes.
3. $\frac{3}{8}$ yd. at \$0.24. Change 2 dimes.
4. $\frac{2}{3}$ yd. at \$0.30. Change a quarter.
5. $\frac{1}{8}$ yd. at \$0.40. Change a quarter.
6. $\frac{1}{6}$ yd. at \$0.30. Change a dime.
7. $\frac{3}{8}$ yd. at \$0.16. Change a dime.
8. $\frac{3}{4}$ yd. at \$0.36. Change 3 dimes.
9. $\frac{3}{8}$ yd. at \$0.40. Change a quarter.
10. Ruth bought $2\frac{1}{4}$ yards of ribbon at \$0.20 a yard. How much did she pay for it?
11. Helen bought $\frac{3}{4}$ yards of ribbon at \$0.24 a yard and $1\frac{3}{8}$ yards of ribbon at \$0.16 a yard. How much did she pay for both kinds of ribbon?
12. Henry sold $1\frac{3}{4}$ bushels of potatoes at \$1.20 a bushel. How much did he receive for them?
13. Frank mowed a lawn in $1\frac{3}{4}$ hours. How much did he receive if he charges 20 cents an hour?
14. Find the cost of $3\frac{1}{2}$ pounds of meat at \$0.32 a pound.

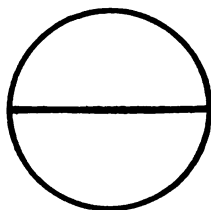
PRACTICE PROBLEMS FOR ORAL SOLUTION

$$2)\overline{\$1.00} \quad 5)\overline{\$1.00} \quad 6)\overline{\$1.00} \quad 3)\overline{\$1.00} \quad 10)\overline{\$1.00}$$

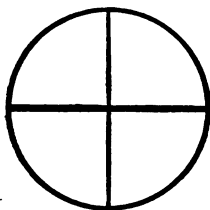
$$4)\overline{\$1.00} \quad 12)\overline{\$1.00} \quad 8)\overline{\$1.00} \quad 16)\overline{\$1.00}$$

1. $\frac{1}{2}$ of a dollar = — cents.
2. $\frac{1}{2}$ of a dollar = $\frac{?}{4}$ of a dollar.
Then $\frac{1}{4}$ of a dollar = — cents.
3. $\frac{1}{4}$ of a dollar = $\frac{?}{8}$ of a dollar.
Then $\frac{1}{8}$ of a dollar = — cents.
4. How much per yard is cloth selling 2 yards for a dollar? 4 yards for a dollar? 8 yards for a dollar?
5. At \$.50 a pound, how many pounds of candy can be bought for a dollar?
6. At \$.25 a dozen, how many dozen apples will \$1.00 pay for?
7. At \$.12 $\frac{1}{2}$ a yard, how many yards of gingham can be purchased with a dollar?
8. $\$ \frac{1}{2} = ?$ $\$ \frac{1}{4} = ?$ $\$ \frac{1}{8} = ?$
9. Find by dividing as shown at the top of the page:
 $\frac{1}{3}$ of a dollar = — cents?
10. $\frac{1}{6}$ of a dollar is — cents?
11. $\frac{1}{3}$ of a dollar = — sixths of a dollar?
12. If I pay a dollar for 3 boxes of stationery, what does each box cost?
13. If 6 collars cost a dollar, what is the price of each?
14. If a hatter gains a dollar on the sale of 8 hats, what does he gain on each?

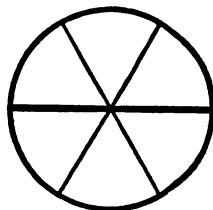
ONE-HALF AND EQUIVALENTS



I



II



III

$$\frac{1}{2} = \frac{?}{4}$$

$$\frac{1}{2} = \frac{?}{6}$$

1. The first circle is divided into 2 halves. The second circle is divided into —.

2. Show $\frac{1}{2}$ of the first circle. Show $\frac{1}{2}$ of the second circle. It is the same as — fourths of the circle.

3. One-half = — fourths. $\frac{1}{2} = \frac{?}{4}$.

4. One-half pound is — fourths of a pound.

5. $\frac{1}{2}$ foot = $\frac{?}{4}$ of a foot.

6. Two fourths of a yard are the same as — of a yard.

7. $\frac{2}{4}$ dozen are the same as — dozen.

8. If you exchange a half dollar for fourths or quarters of a dollar you should receive — quarters. $\frac{1}{2} = \frac{2}{4}$.

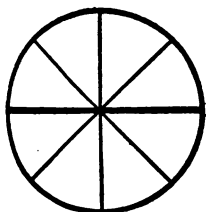
9. The third circle is divided into — sixths.

10. Show $\frac{1}{2}$ of the circle. It contains — sixths of the circle.

11. One half = $\frac{3}{6}$ $\frac{1}{2} = \frac{3}{6}$ 13. $\frac{1}{2}$ foot = $\frac{3}{6}$ of a foot.

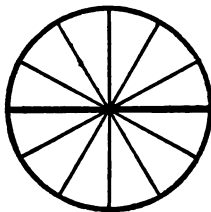
12. $\frac{1}{2}$ dozen = $\frac{3}{6}$ of a dozen 14. $\frac{1}{2}$ yard = $\frac{3}{6}$ of a yard.

ONE-HALF AND EQUIVALENTS



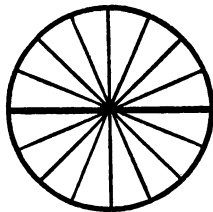
IV

$$\frac{1}{2} = \frac{?}{8}$$



V

$$\frac{1}{2} = \frac{?}{12}$$



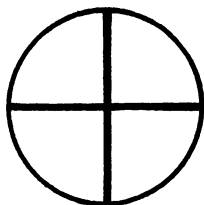
VI

$$\frac{1}{2} = \frac{?}{16}$$

15. The fourth circle is divided into — eighths.
16. Show $\frac{1}{2}$ of the first circle. Show $\frac{1}{2}$ of the fourth circle. It is the same as — eighths of the circle.
17. One half = — eighths. $\frac{1}{2} = \frac{?}{8}$
18. The fifth circle is divided into — twelfths.
19. Show $\frac{1}{2}$ of the circle. It contains — twelfths of the circle.
20. One half = — twelfths. $\frac{1}{2} = \frac{6}{12}$.
21. $1 = 1\frac{1}{2}$ dozen. $\frac{1}{2}$ dozen = $\frac{?}{12}$ dozen.
22. 1 inch = $\frac{1}{12}$ foot. $\frac{1}{2}$ foot = $\frac{?}{12}$ foot.
- $$\frac{1}{2} = \frac{6}{12}$$
23. The sixth circle is divided into — sixteenths.
24. Find how many sixteenths of the circle in $\frac{1}{2}$ of it.
25. 1 oz. = $\frac{1}{16}$ of a pound. $\frac{1}{2}$ pound = $\frac{?}{16}$ of a pound.

$$\frac{1}{2} = \frac{8}{16}$$

ONE-FOURTH AND EQUIVALENTS



I

$$\frac{1}{4} = \frac{?}{8}$$

$$\frac{1}{4} = \frac{?}{16}$$

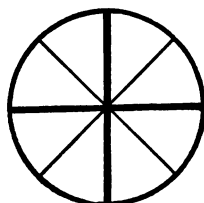
$$\frac{1}{4} = \frac{?}{12}$$

1. The first circle is marked off into fourths. The second is divided into — eighths.

2. Find $\frac{1}{4}$ of the first circle. Show $\frac{1}{8}$ of the second circle. In $\frac{1}{4}$ of the circle there are — eighths.

3. A pint = $\frac{1}{8}$ of a gallon. $\frac{1}{4}$ of a gallon is — eighths of a gallon.

4. $\frac{1}{4}$ of a bushel is — eighths of a bushel.



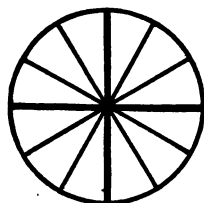
II

5. 1 quart = $\frac{1}{8}$ of a peck. $\frac{1}{4}$ of a peck = $\frac{?}{8}$ of a peck.

6. $\frac{1}{4}$ of a pound = $\frac{2}{?}$ of a pound.

$$\frac{1}{4} = \frac{2}{8}$$

7. Find $\frac{1}{4}$ of the first circle, then $\frac{1}{4}$ of the fourth.



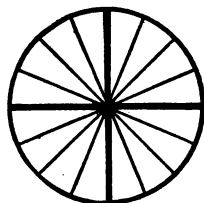
III

8. Into how many sixteenths is the fourth circle divided?

9. $\frac{1}{4}$ of the circle = $\frac{?}{16}$ of the circle

10. 1 oz. = $\frac{1}{16}$ of a pound. $\frac{1}{4}$ of a pound = $\frac{?}{16}$ of a pound.

$$\frac{1}{4} = \frac{4}{16}$$

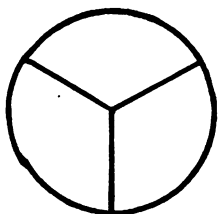


IV

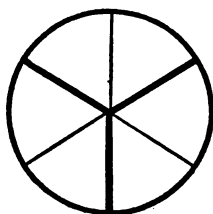
into — twelfths.

11. The third circle is marked off $\frac{1}{4}$ of the circle contains — twelfths.

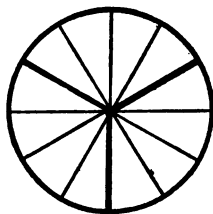
ONE-THIRD AND EQUIVALENTS



I



II



III

$$\frac{1}{3} = \frac{?}{6}$$

$$\frac{1}{3} = \frac{?}{12}$$

1. The first circle is marked off into — thirds. The second circle is divided into — sixths. Look at $\frac{1}{3}$ of the first circle and then find $\frac{1}{3}$ of the second circle. It contains —?

2. $\frac{1}{3}$ of a foot = $\frac{?}{6}$ foot.

3. $\frac{1}{3}$ of a dozen = $\frac{?}{6}$ dozen.

4. $\frac{1}{3}$ of a yard = $\frac{?}{6}$ yard.

5. The third circle is divided into — twelfths. Look at $\frac{1}{3}$ of the first circle and then find $\frac{1}{3}$ of the third one. It contains — twelfths.

6. $\frac{1}{3}$ of a foot = $\frac{?}{12}$ foot. 7. $\frac{1}{3}$ of a yard = $\frac{?}{12}$ yard.

8. The second circle is divided into — sixths. The third circle is divided into — twelfths. Show $\frac{1}{6}$ of the second circle. Show $\frac{1}{6}$ of the third. It contains — of the circle.

9. $\frac{1}{3}$ of 12 = ?

10. $\frac{1}{3}$ of 24 = ?

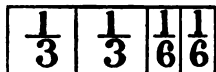
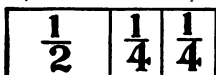
11. $\frac{1}{6} = \frac{?}{12}$

12. $\frac{2}{6}$ of 12 = ?

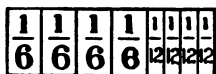
13. $\frac{2}{6}$ of 24 = ?

14. $\frac{1}{6}$ or $\frac{2}{12}$ of 24 = ?

A GAME OF PARTS



.



This game may be played by 2, 3 or 4 people. Each one first makes his own set of parts as follows:

1. Cut from light-weight cardboard 5 oblongs 6" by 2".

2. Very carefully rule 4 of them into parts and name as shown in the cut. Leave the first oblong uncut for a measure.

the cut. Leave the first oblong uncut for a measure.

3. Cut along the lines you have drawn. Write your name or initials on the back of each slip.

4. Bring or make an envelope in which to keep your game.

The game may be used in several ways.

I. Each player empties all the slips from his envelope into a common heap. Each in turn then quickly takes a slip until all are gone. When the last slip is taken, the players may begin building wholes from the slips they have drawn. The one who can first make 3 wholes from his parts, measures them with the uncut card in his set, and calls "Three Wholes."

II. Start as before. Have a time limit of from 2 to 4 minutes. The one who in this time has got the greatest number of equivalents for $\frac{1}{2}$ wins.

III. This way is something like "Authors." Each player, in turn, quickly draws 2 slips from the pile until he has taken 10. The rest are put into a box. The one who first fits all his parts into wholes, or is the first to make three wholes, wins. Besides the slips he has drawn, each player in turn may ask of any other player the slips he needs, giving in return an equivalent, thus $\frac{2}{12}$ for $\frac{2}{8}$; $\frac{1}{4}$ for $\frac{2}{8}$, etc.

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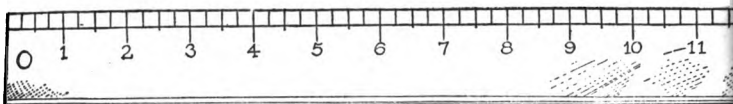
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TABLES OF DENOMINATE NUMBERS



Foot Rule, reduced to one third of its true length.

For Measuring Lengths:

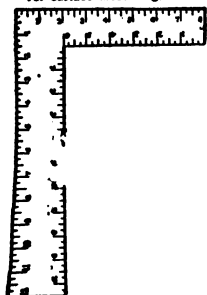


Tape Measure



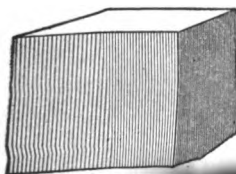
Surveyor's Chain*

For Surface Measuring:



Carpenter's Square

Illustrating Solids:



Cube

Linear Measure

12 inches (in.)	= 1 foot	(ft.)
3 feet	= 1 yard	(yd.)
5½ yards, or 16½ feet	= 1 rod	(rd.)
40 rods	= 1 furlong	(fur.)
320 rods, or 5280 feet	= 1 mile	(mi.)
1 mi.	= 320 rd. = 1760 yd. = 5280 ft. = 63,360 in.	

Surveyors' Linear Measure

7.92 inches (in.)	= 1 link	(l.)
25 links	= 1 rod	(rd.)
100 links	= 1 chain	(ch.)
80 chains	= 1 mile	(mi.)

Square Measure

144 square in. (sq. in.)	= 1 square foot (sq. ft.)
9 square feet (sq. ft.)	= 1 square yard (sq. yd.)
360 sq. yd., or 272½ sq. ft.	= 1 square rod (sq. rd.)
160 square rods	= 1 acre (A.)
640 acres	= 1 square mile (sq. mi.)
1 A.	= 160 sq. rd. = 4840 sq. yd. = 43,560 sq. ft.

Surveyors' Square Measure

16 square rods	= 1 square chain (sq. ch.)
10 square chains	= 1 acre (A.)
640 acres	= 1 square mile (sq. mi.)
1 square mile	= 1 section (sec.)
36 sections	= 1 Cong. township (T.)

Cubic Measure

1728 cubic inches (cu. in.)	= 1 cubic foot (cu. ft.)
27 cubic feet	= 1 cubic yard (cu. yd.)
128 cubic feet	= 1 cord (cd.)
16 cubic feet	= 1 cord foot (cd. ft.)
8 cord feet	= 1 cord (cd.)

*Instead of the standard (Gunter's) chain, some surveyors use a steel tape 50 feet long, divided into foot being marked off into tenths.

